

EBASCO

REM III PROGRAM

**REMEDIAL PLANNING ACTIVITIES
AT SELECTED UNCONTROLLED
HAZARDOUS SUBSTANCE DISPOSAL SITES**



EPA CONTRACT 68-01-7250

EBASCO SERVICES INCORPORATED

318167



VIN 002 0830

F

EPA WORK ASSIGNMENT NUMBER: 37-2LB8
EPA CONTRACT NUMBER: 68-01-7250
EBASCO SERVICES INCORPORATED

VINELAND CHEMICAL COMPANY SITE
FINAL DRAFT
REMEDIAL INVESTIGATION REPORT
RIVER AREAS
VINELAND, NEW JERSEY

JUNE 1989

APPENDICES A - M

NOTICE

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APPENDIX A

CHEMICAL RESULTS FOR PHASE I SAMPLING

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VINELAND CHEMICAL COMPANY SITE
PHASE I INORGANIC ANALYTICAL RESULTS OF WATER SAMPLES COLLECTED FROM
BLACKWATER BRANCH, MAURICE RIVER (MR), LITTLE ROBIN BRANCH (LRB), AND MILL CREEK (MC)
ALL VALUES IN ug/L (FILTER SAMPLES ARE REPORTED IN ug/F)

Parameter	BLACKWATER BRANCH						MAURICE RIVER						LRB	MAURICE RIVER				PB	MC	MR			
	ER-0 (Surface) (a)	ER-1 Surface (b)	ER-2 Surface (c)	ER-3 Surface	ER-4 (Surface)	ER-5 Surface	ER-6 (Surface)	ER-7 Surface	ER-8 (Bottom)	ER-9 Surface	ER-10 (Surface)	ER-11 Surface	ER-12 Surface	ER-13 Surface	ER-14 Surface								
	S1	S2	S3	C1	C2	C3	C1	C2	Bottom (j)	S1	S2	C1	C2	Bottom									
Aluminum(d)	Al	(c)			118	96	70	72	-	71	65	-	-	-	65	74	-	88(R)	88(R)				
Antimony	Sb				(R)	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Arsenic	As				4.5(R)9	2.4(R)	1.4(R)	<0.5	<0.5	330	290	280	-	-	70	70	-	67	62				
Filter(e)	As	<10	<10	<10	<10	<10(R)	39	35.5	38.5	43	118	<0.5	<0.5	0.5	13	13	14.7	11.0	<5	5.54	8.6		
Dissolved(f)	As							250(R)	208	215(R)	698	<10	<10	<10	124	128	114(R)	106(R)	56(R)	58(R)0	51(R)		
Barium	Ba				102	83	82	85	-	44	45	-	-	50	56	-	53	54	76	49			
Beryllium	Be				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Cadmium	Cd				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Calcium	Ca				3170(R)	3430(R)	3330(R)	3480(R)		3890(R)	3870(R)			3850	3860(R)	-	4250(R)	4100(R)	11500	1480	2060		
Chromium	Cr				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Cobalt	Co				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Copper	Cu				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Iron	Fe	4620(R)	2229(R)	1230(R)	255	496	904	873	504	557	571	10(R)	-	-	-	-	-	-	-	-			
Dissolved	Fe	525	589	523	275(R)	177(R)	270(R)	252(R)	217(R)	341(R)	572(R)	122	350(R)	78.2(R)	533(2)	617	1240	1040	6930	5.3(R)	857(2)		
Lead	Pb					267(R)	362(R)	520(R)	516(R)	474(R)	716	522	475	476	473	486	549	117(R)	153(R)	1550(3)	179(R)	133	
Manganese	Mn					2570(R)	-	7.9(R)	9.9(R)	7(R)	9.3	-	-	-	-	-	513	5720	759(3)	672(R)	656(2)	4680(2)	
Mercury	Hg				30	2380(R)	2340(R)	2410(R)	2180(R)	2140(R)	2260	-	-	-	-	-	-	-	10(R)	-	639(R)	676(R)	
Nickel	Ni				0.3	29	29	27	22	25	25	7	27	-	-	-	2470(R)	2470(R)	5190	2630	2500		
Potassium	K				-	-	-	-	-	-	-	-	-	-	-	-	33	28	211	37	37		
Selenium	Se				2640(R)	-	2320(R)	2300(R)	2340(R)	1650(R)	1530(R)	-	-	-	-	-	-	-	-	-	-		
Silver	Ag				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5(R)	-		
Sodium	Na				-	5.1	-	-	-	-	-	-	-	-	-	-	-	-	-	12300	2200	2120	
Thallium	Tl				7820(R)	-	6900(R)	6270(R)	6130(R)	4110(R)	3920(R)	-	6030(R)	4280(R)	-	-	-	-	-	-	-	-	
Tin	Tn				-	-	-	-	-	-	-	-	-	-	5	(R)	4.2	(R)	(R)	(R)	(R)		

- a) Indicates that the sample was obtained from the top six inches of the water column.
- b) Indicates the sample was split to form a duplicate sample (S1, S2) or a triplicate sample (S1, S2, S3). Duplicate and triplicate analyses are used to determine how consistent a single measurement is of a single water sample.
- c) Blank spaces indicate that the sample was not analyzed for the particular parameter.
- d) The analytical results of the analysis of an unfiltered sample (see notes e and f below).
- e) The results of the analyses of the filter papers are in ug/filter. One liter of water was filtered through each filter.
- f) The results of the analyses of the filtrate (see note d, above).
- (R) indicates that the analytical result was rejected by the Environmental Services Division.
- Dashes indicate that the parameter was not detected in the sample.
- Collocated samples (C1, C2...) were collected at several sampling locations. These samples were collected to attempt to define how representative the sample is of the greater volume of water the sample represents. Collocated samples are separate samples collected adjacent to one another or shortly after one another at the exact location.
- Indicates that the sample was obtained from the bottom of the water column at the water/sediment interface.

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VINELAND CHEMICAL COMPANY SITE
PHASE I INORGANIC ANALYTICAL RESULTS OF SEDIMENT SAMPLES COLLECTED FROM
BLACKWATER BRANCH; MAURICE RIVER (MR), LITTLE ROBIN BRANCH (LRB), PARVIN BRANCH (PB), AND MILL CREEK (MC)
ALL VALUES IN MG/KG (TOC RESULTS ARE REPORTED IN PERCENT)

Parameter	BLACKWATER BRANCH						MAURICE RIVER						LRB		MR		PB		MC		HR					
	ER-0 (a) C1	C2	C3	ER-1 C1	C2	ER-2	ER-3	ER-4 C1	C2	C3	ER-5	ER-6 C1	C2	ER-7 C1	C2	ER-8	ER-9 S1 S2	ER-10	ER-11 C1	C2	ER-12 C1	C2	ER-13 C1	C2	ER-14	
Aluminum Al	(b)			2030	3930	3330		327	2100	2270		1090							287	426						
Antimony Sb				(d)	-	-		-	-	-		-							-	-						
Arsenic As				-	-	-		-	-	-		-														
Arsenic(SAS) (c)	As	5	5	5	5	5		331	22	24	21	74	5	51	89	104	5	5	70.3	5	5	5	5	2.4	2.6	
Barium Ba				53	65	112		4.7	44	43		16							-	-						
Beryllium Be				-	-	-		-	-	-		-														
Cadmium Cd				-	-	7.9		-	-	8.3		-							-	-						
Calcium Ca				1890	8800	961		135	1230	1120		317														
Chromium Cr				30	13	8.4		-	-	-		-														
Cobalt Co				-	-	-		-	-	-		-														
Copper Cu				27	31	31		4.4	9.9	6.6		6.8														
Iron Fe	760	1370	569					5640	12800	4130	1750	1610	1260		2640				3.3	4						
Lead Pb				1310	1290	1720		1030	610	504	205	389		2080	786	2860	794	864	888	3990	1030	1420				
Magnesium Mg				195	219	130		-	5.5	13(J)	17(J)		15						1250	1570	588	458				
Manganese Mn				811	4450	396		-	46	232	251		74						5.1	8.5						
Mercury Hg				58	80	9.2		4.1	31	24		11							38	32						
Nickel Ni				1.8	3.2	10		-	0.5(J)	0.6(J)		-							-	38						
Potassium K				117	15	-		-	-	-		-							-	-						
Selenium Se				-	298	-		-	-	-		-							-	-						
Silver Ag				-	-	-		-	-	-		-							-	-						
Sodium Na				-	-	-		-	-	-		-							-	-						
Thallium Tl				-	-	-		-	-	-		-							-	-						
Tin Sn				-	-	-		-	-	-		-							-	-						
Vanadium V				-	-	-		-	-	-		-							-	-						
Zinc Zn				5.1	16	11		-	7.3	-		8.6														
Total Organic Carbon (SAS) TOC	0.76	1.06	0.89	6.5(R)	0.8(R)	3.83	12.99	1.16	47.2	3.67	0.84	1.95	2.45	1.93	1.41	11.6(R)	9.75(R)	0.065	(R)	(R)	0.072	0.12	0.14	0.17		

- a) Collocated samples (C1, C2,...) were collected at several sampling locations. These samples were collected to attempt to define how representative the sample is of the greater volume of sediment the sample represents. Collocated samples are separate samples collected adjacent to one another.
- b) Blank spaces indicate that the sample was not analyzed for the particular parameter.
- c) Special Analytical Services (SAS) were performed on all sediment samples for As, Fe, and TOC. Selected samples were analyzed for the Hazardous Substance List (HSL) inorganic compounds listed in the parameter section of the table.
- d) Dashes indicate that the parameter was not detected in the sample.
- e) (R) indicates that the analytical result was rejected by the Environmental Services Division.
- f) (J) indicated that the value is estimated.
- g) The sample was split in the field and separate analyses were performed on each half of the sample. These results are useful in defining how consistent a single measurement is of a single sample.

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VINELAND CHEMICAL COMPANY SITE
PHASE I ORGANIC ANALYTICAL RESULTS OF SEDIMENT AND SURFACE WATER SAMPLES COLLECTED FROM
BLACKWATER BRANCH, MAURICE RIVER (MR), LITTLE ROBIN BRANCH (LRB), PARVIN BRANCH (PB), AND MILL CREEK (MC)

A. SEDIMENT RESULTS (MG/KG)

Parameter ^a	BLACKWATER BRANCH						MR	LBR	MR	PB	MC	ER-11	ER-12	ER-13	MR	
	ER-0	ER-1	ER-2	ER-3	C1	ER-4	ER-5	ER-6	ER-7	ER-8	ER-9	ER-10	C1	C2		
		C1	C2		C1	C2	C3									
Acetone	b	86	-	-		1110	3500	620		-			970	-		
Toluene		37	-	-		-	-	-					-	-		
Unknown		60	51	-		-	-	83		72			-	38		
Tetrachloroethene		-	-	7		-	-	-		-			-	-		
Dichlorodifluoromethane		-	-	-		-	480	-		-			69	-		

B. WATER RESULTS (UG/L)

Parameter ^a	BLACKWATER BRANCH						MR	LBR	MR	PB	MC	ER-11	ER-12	ER-13	MR	
	ER-0	ER-1	ER-2	ER-3	ER-4 (Surface)	ER-5	(Sur-	ER-7	ER-8	ER-9	ER-10	(Sur-	ER-11	ER-12	ER-13	ER-14
		Surface			C1	C2	C3		C1	C2	Surface	Bottom	C1	C2		
Acetone	b	- ^c			-	-	-		260	120	-	-	36	69	-	
Dichlorofluoromethane		-			-	-	-		-	-	-	-	-	73	-	-
2-Butanone		-			-	-	-		-	-	-	-	-	-	-	2

- a. Thirty-five VOA parameters are reported for each of the samples which were analyzed. In addition more than _____ parameters could be identified as "Tentatively Identified Compounds" as a result of mass spectra analyses. Only those compounds which were detected are reported on this table.
- b. Blank spaces indicative that the sample was not analyzed.
- c. Dashes indicate that the parameter was not detected in the sample.
- d. Indicates colocated samples at an individual sample location.

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APPENDIX B

VIN 202 0837

APPENDIX B

CHEMICAL RESULTS FOR PHASE II SAMPLING

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VIN 002

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VINELAND CHEMICAL COMPANY SITE
SURFACE WATER ANALYSES
DISSOLVED ARSENIC CONCENTRATIONS
(UG/L)

DATE: 05/11/88
PAGE 1

SAMPLE ID	STATION	CLP SAMPLE ID	DATE SAMPLED	DISSOLVED ARSENIC	OTHER ANALYSES PERFORMED				
ERO-W	ER-0	3097B-239	07/14/87	4.000U	INORG	TOTAS	VOA	BNA	PESPCB
EROA-W	ER-0A	3097B-737	07/15/87	4.000U	INORG	TOTAS	VOA	BNA	PESPCB
EROB-W	ER-0B	3097B-045	06/30/87	4.000U	TOTAS	INORG	VOA	BNA	PESPCB
EROC-W	ER-0C	3097B-1083	07/29/87	4.000U	TOTAS	INORG	VOA	BNA	PESPCB
ER1-W	ER-1	3097B-041	06/29/87	5.500J	TOTAS	INORG	PESPCB	VOA	BNA
ER2-W	ER-2	3097B-734	07/16/87	4.000U	TOTAS	INORG	VOA		
ER2-WDUP	ER-2	3097B-732	07/16/87	4.000U	TOTAS				
ER3-W	ER-3	3097B-125	07/10/87	4.800J	INORG	TOTAS	VOA		
ER3A-W	ER-3A	3097B-1105	07/29/87	2790.000	INORG	TOTAS	VOA		
ER4-W	ER-4	3097B-240	07/13/87	202.000	TOTAS	INORG	BNA	VOA	PESPCB
ER5-W	ER-5	3037B-267	06/25/87	460.000J	INORG	TOTAS	VOA		
ER6-W	ER-6	3097B-043	06/29/87	4.000U	INORG	TOTAS	VOA		
ER6A-W	ER-6A	3097B-736	07/15/87	4.000U	INORG	TOTAS	VOA	BNA	PESPCB
ER6A-WDUP	ER-6A	3097B-738	07/16/87	4.000U	INORG	TOTAS	VOA	BNA	PESPCB
ER7-W	ER-7	3097B-733	07/15/87	91.000U	INORG	TOTAS	VOA	BNA	PESPCB
ER8-W	ER-8	3097B-039	06/27/87	46.800	INORG	TOTAS	VOA	BNA	PESPCB
ER9-W	ER-9	3097B-038	07/01/87	4.000U	INORG	TOTAS	VOA		
ER9A-W	ER-9A	3097B-120	07/09/87	65.000	INORG	TOTAS	VOA	BNA	PESPCB
ER9C-W	ER-9C	3097B-121	07/09/87	56.000	INORG	TOTAS	VOA		
ER9D-W	ER-9D	3097B-048	06/30/87	4.400J	INORG	TOTAS	VOA	BNA	PESPCB
ER9E-W	ER-9E	3097B-124	07/10/87	48.000	INORG	TOTAS	VOA	BNA	PESPCB
ER9F-W	ER-9F	3097B-042	07/06/87	36.000	INORG	TOTAS	VOA	BNA	PESPCB
ER10-W	ER-10	3097B-122	07/09/87	32.000	TOTAS	INORG	VOA		
ER10A-W	ER-10A	3097B-123	07/09/87	28.000	INORG	VOA	TOTAS		
ER11-W	ER-11	3037B-300	06/23/87	8.200UJ	INORG	TOTAS	PESPCB	VOA	BNA
ER20-W	ER-20	3097B-1200	08/04/87	39.000	TOTAS	INORG			
ER21-W	ER-21	3097B-1204	08/04/87	37.000	INORG	TOTAS			
ER22-W	ER-22	3097B-1208	08/04/87	32.000	INORG	TOTAS			
ER23-W	ER-23	3097B-1212	08/04/87	26.000	TOTAS	INORG			
ER26-W	ER-26	3097B-1216	08/04/87	27.000	INORG	TOTAS			
ER27-W	ER-27	3097B-1220	08/04/87	26.000	TOTAS	INORG			
ER29-W	ER-29	3097B-1224	08/04/87	17.000	INORG	TOTAS			
ER32-W	ER-32	3097B-1228	08/04/87	16.000	INORG	TOTAS			
ER32-WDUP	ER-32	3097B-1232	08/04/87	15.000	TOTAS	INORG			
ER37-W	ER-37	3097B-1236	08/04/87	7.200J	TOTAS	INORG			
ER38-W	ER-38	3097B-1240	08/04/87	5.800J	TOTAS	INORG			
ER39-W	ER-39	3097B-1248	08/05/87	7.100J	INORG	TOTAS			
ER40-W	ER-40	3097B-1244	08/05/87	10.000	INORG	TOTAS			

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER ANALYSES
 DISSOLVED ARSENIC CONCENTRATIONS
 (UG/L)

DATE: 05/11/88
 PAGE 2

SAMPLE ID	STATION	CLP SAMPLE ID	DATE SAMPLED	DISSOLVED ARSENIC	OTHER ANALYSES PERFORMED
ER43-W	ER-43	3097B-1252	08/05/87	10.000	INORG TOTAS
ER44-W	ER-44	3097B-1256	08/05/87	5.000U	INORG TOTAS
ER45-W	ER-45	3097B-1274	08/06/87	8.400J	INORG TOTAS
ER50-W	ER-50	3097B-1266	08/05/87	5.300J	INORG TOTAS

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ERO-W	EROA-W	EROB-W	EROC-W	ER1-W	ER2-W	ER3-W
CASE NUMBER	7615	7615	7537	7729	7537	7615	7573
CLP SAMPLE ID	BK-468	BK-731	BL-454	BK-694	BL-445	BK-738	BK-466
DATE SAMPLED	07/14/87	07/15/87	06/30/87	07/29/87	06/27/87	07/15/87	07/10/87
-----	-----	-----	-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U						
BROMOMETHANE	10.000 U						
VINYL CHLORIDE	10.000 U	10.000 X					
CHLOROETHANE	10.000 U						
METHYL CHLORIDE	5.000 U	5.000 U	6.000 X	5.000 U	5.000 X	5.000 U	10.000 X
ACETONE	14.000 X	26.000 X	10.000 U	11.000 X	12.000 X	19.000 X	10.000 X
CARBON DISULFIDE	5.000 U						
1,1-DICHLOROETHENE	5.000 U						
1,1-DICHLOROETHANE	5.000 U						
TRANS-1,2-DICHLOROETHENE	5.000 U						
CHLOROFORM	5.000 U						
1,2-DICHLOROETHANE	5.000 U						
2-BUTANONE	10.000 U	10.000 U	10.000 U	10.000 X	10.000 U	10.000 U	10.000 U
1,1,1-TRICHLOROETHANE	5.000 U	10.000 U					
CARBON TETRACHLORIDE	5.000 U						
VINYL ACETATE	10.000 U						
BROMODICHLOROMETHANE	5.000 U						
1,2-DICHLOROPROPANE	5.000 U						
TRANS-1,3-DICHLOROPROPENE	5.000 U						
TRICHLOROETHENE	5.000 U						
DIBROMOCHLOROMETHANE	5.000 U						

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
 - (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

1680-7007 N I A

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ER0-W	ER0A-W	ER0B-W	ER0C-W	ER1-W	ER2-W	ER3-W
CASE NUMBER	7615	7615	7537	7729	7537	7615	7573
CLP SAMPLE ID	BK-468	BK-731	BL-454	BK-694	BL-445	BK-738	BK-466
DATE SAMPLED	07/14/87	07/15/87	06/30/87	07/29/87	06/27/87	07/15/87	07/10/87
-----	-----	-----	-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
BENZENE	5.000 U	5.000 U	5.000 U	5.000 U	4.000 J	5.000 U	5.000 U
CIS-1,3-DICHLOROPROPENE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
2-CHLOROETHYL VINYLETHER	10.000 U	10.000 U	10.000 U	10.000 U	10.000 U	10.000 U	10.000 U
BROMOFORM	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
4-METHYL-2-PENTANONE	10.000 U	10.000 U	10.000 U	10.000 U	4.000 J	10.000 U	10.000 U
2-HEXANONE	10.000 U	10.000 U	10.000 U	10.000 U	10.000 U	10.000 U	10.000 U
TETRACHLOROETHENE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
1,1,2,2-TETRACHLOROETHANE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
TOLUENE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	10.000 U
CHLOROBENZENE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
ETHYLBENZENE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
STYRENE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
TOTAL XYLEMES	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
TOTAL TICS	0.000	0.000	1.000	0.000	4.000	0.000	1.000
TIC CONCENTRATION	0.000 A	0.000 A	145.000 A	0.000 A	473.000 A	0.000 A	5.000 A

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER3A-W	ER4-W	ER5-W	ER6-W	ER6A-W	ER6A-WDUP	ER7-W
CASE NUMBER	7729	7615	7508	7537	7615	7615	7615
CLP SAMPLE ID	BL-022	BK-469	BJ-941	BL-442	BK-736	BK-735	BK-732
DATE SAMPLED	07/29/87	07/13/87	06/25/87	06/29/87	07/15/87	07/16/87	07/15/87
-----	-----	-----	-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U	10.000 U					
BROMOMETHANE	10.000 U	10.000 U					
VINYL CHLORIDE	10.000 U	10.000 U					
CHLOROETHANE	10.000 U	10.000 U					
METHYL CHLORIDE	4.000 J	5.000 U	5.000 U				
ACETONE	33.000 X	10.000 U	14.000 X	10.000 X	7.000 X	14.000 X	9.000 X
CARBON DISULFIDE	5.000 U	5.000 U					
1,1-DICHLOROETHENE	5.000 U	5.000 U					
1,1-DICHLOROETHANE	5.000 U	5.000 U					
TRANS-1,2-DICHLOROETHENE	5.000 U	5.000 U					
CHLOROFORM	5.000 U	5.000 U					
1,2-DICHLOROETHANE	5.000 U	5.000 U					
2-BUTANONE	10.000 X	10.000 U	10.000 U				
1,1,1-TRICHLOROETHANE	5.000 U	5.000 U					
CARBON TETRACHLORIDE	5.000 U	5.000 U					
VINYL ACETATE	10.000 U	10.000 U					
BROMODICHLOROMETHANE	5.000 U	5.000 U					
1,2-DICHLOROPROPANE	5.000 U	5.000 U					
TRANS-1,3-DICHLOROPROPENE	5.000 U	5.000 U					
TRICHLOROETHENE	5.000 U	5.000 U					
DIBROMOCHLOROMETHANE	5.000 U	5.000 U					

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER3A-W	ER4-W	ER5-W	ER6-W	ER6A-W	ER6A-WDUP	ER7-W
CASE NUMBER	7729	7615	7508	7537	7615	7615	7615
CLP SAMPLE ID	BL-022	BK-469	BJ-941	BL-442	BK-736	BK-735	7615
DATE SAMPLED	07/29/87	07/13/87	06/25/87	06/29/87	07/15/87	07/16/87	07/15/87
-----	-----	-----	-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U	5.000 U					
BENZENE	5.000 U	5.000 U					
CIS-1,3-DICHLOROPROPENE	5.000 U	5.000 U					
2-CHLOROETHYL VINYLETHER	10.000 U	10.000 U					
BROMOFORM	5.000 U	10.000 U					
4-METHYL-2-PENTANONE	10.000 U	10.000 U	10.000 U	3.000 J	10.000 U	10.000 U	10.000 U
2-HEXANONE	10.000 U	10.000 U					
TETRACHLOROETHENE	5.000 U	10.000 U					
1,1,2,2-TETRACHLOROETHANE	5.000 U	5.000 U					
TOLUENE	5.000 U	5.000 U	5.000 U	1.000 U	5.000 U	5.000 U	5.000 U
CHLOROBENZENE	5.000 U	5.000 U					
ETHYLBENZENE	5.000 U	5.000 U					
STYRENE	5.000 U	5.000 U					
TOTAL XYLEMES	5.000 U	5.000 U					
TOTAL TICS	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TIC CONCENTRATION	0.000 A	0.000 A					

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 3

SAMPLE ID	ER7-WDUP	ER8-W	ER9-W	ER9A-W	ER9C-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7537	7537	7573	7573	7537	7573
CLP SAMPLE ID	BK-733	BL-444	BL-457	BK-458	BK-459	BL-447	BK-464
DATE SAMPLED	07/15/87	06/27/87	07/01/87	07/09/87	07/09/87	06/30/87	07/10/87
-----	-----	-----	-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U						
BROMOMETHANE	10.000 U						
VINYL CHLORIDE	10.000 U						
CHLOROETHANE	10.000 U						
METHYL CHLORIDE	5.000 U	3.000 X	8.000 X	5.000 U	10.000 U	10.000 U	10.000 U
ACETONE	15.000 X	6.000 X	10.000 U	10.000 X	10.000 X	10.000 U	5.000 U
CARBON DISULFIDE	5.000 U	13.000 X	10.000 X				
1,1-DICHLOROETHENE	5.000 U						
1,1-DICHLOROETHANE	5.000 U						
TRANS-1,2-DICHLOROETHENE	5.000 U	9.000	5.000 U				
CHLOROFORM	5.000 U						
1,2-DICHLOROETHANE	5.000 U						
2-BUTANONE	10.000 U	5.000 U	5.000 U				
1,1,1-TRICHLOROETHANE	5.000 U	10.000 U	10.000 U				
CARBON TETRACHLORIDE	5.000 U						
VINYL ACETATE	10.000 U	5.000 U	5.000 U				
BROMODICHLOROMETHANE	5.000 U	5.000 U	5.000 U	10.000 U	10.000 U	10.000 U	10.000 U
1,2-DICHLOROPROPANE	5.000 U						
TRANS-1,3-DICHLOROPROPENE	5.000 U						
TRICHLOROETHENE	5.000 U	11.000	5.000 U	3.000 J	5.000 U	5.000 U	5.000 U
DIBROMOCHLOROMETHANE	5.000 U	5.000 U	5.000 U	5.000 U	2.000 J	5.000 U	5.000 U
-----	-----	-----	-----	-----	5.000 U	5.000 U	5.000 U

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 3 (CONT.)

SAMPLE ID	ER7-WDUP	ER8-W	ER9-W	ER9A-W	ER9C-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7537	7537	7573	7573	7537	7573
CLP SAMPLE ID	BK-733	BL-444	BL-457	BK-458	BK-459	BL-447	BK-464
DATE SAMPLED	07/15/87	06/27/87	07/01/87	07/09/87	07/09/87	06/30/87	07/10/87
-----	-----	-----	-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U						
BENZENE	5.000 U						
CIS-1,3-DICHLOROPROPENE	5.000 U						
2-CHLOROETHYL VINYLETHER	10.000 U						
BROMOFORM	5.000 U						
4-METHYL-2-PENTANONE	10.000 U						
2-HEXANONE	10.000 U						
TETRACHLOROETHENE	5.000 U	10.000 U	10.000 U				
1,1,2,2-TETRACHLOROETHANE	5.000 U	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	5.000 U
TOLUENE	5.000 U	5.000 U	5.000 U	5.000 U	1.000 U	5.000 U	5.000 U
CHLOROBENZENE	5.000 U						
ETHYLBENZENE	5.000 U						
STYRENE	5.000 U						
TOTAL XYLEMES	5.000 U						
TOTAL TICS	0.000	1.000	3.000	0.000	0.000	0.000	0.000
TIC CONCENTRATION	0.000 A	81.000 A	1.037 M	0.000 A	0.000 X	0.000 A	0.000 A

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 4

SAMPLE ID	ER9F-W	ER10-W	ER10A-W	ER11-W
CASE NUMBER	7537	7573	7573	7508
CLP SAMPLE ID	BL-466	BK-460	BK-461	BJ-926
DATE SAMPLED	07/06/87	07/09/87	07/09/87	06/23/87
-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U	10.000 U	10.000 X	10.000 U
BROMOMETHANE	10.000 U	10.000 U	10.000 X	10.000 U
VINYL CHLORIDE	10.000 X	10.000 U	10.000 X	10.000 U
CHLOROETHANE	10.000 U	10.000 U	10.000 X	10.000 U
METHYL CHLORIDE	5.000 U	5.000 U	10.000 X	5.000 U
ACETONE	10.000 U	10.000 X	10.000 X	10.000 U
CARBON DISULFIDE	5.000 U	5.000 U	5.000 X	5.000 U
1,1-DICHLOROETHENE	5.000 U	5.000 U	5.000 X	5.000 U
1,1-DICHLOROETHANE	5.000 U	5.000 U	5.000 X	5.000 U
TRANS-1,2-DICHLOROETHENE	5.000 U	5.000 U	5.000 X	5.000 U
CHLOROFORM	5.000 U	5.000 U	5.000 X	5.000 U
1,2-DICHLOROETHANE	5.000 U	5.000 U	5.000 X	5.000 U
2-BUTANONE	10.000 U	10.000 U	10.000 X	10.000 U
1,1,1-TRICHLOROETHANE	5.000 U	5.000 U	5.000 X	5.000 U
CARBON TETRACHLORIDE	5.000 U	5.000 U	5.000 X	5.000 U
VINYL ACETATE	10.000 U	10.000 U	10.000 X	10.000 U
BROMODICHLOROMETHANE	5.000 U	5.000 U	5.000 X	5.000 U
1,2-DICHLOROPROPANE	5.000 U	5.000 U	5.000 X	5.000 U
TRANS-1,3-DICHLOROPROPENE	5.000 U	5.000 U	5.000 X	5.000 U
TRICHLOROETHENE	5.000 U	5.000 U	5.000 X	5.000 U
DIBROMOCHLOROMETHANE	5.000 U	5.000 U	5.000 X	5.000 U

EXPLANATION OF CODES:

 J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 4 (CONT.)

SAMPLE ID	ER9F-W	ER10-W	ER10A-W	ER11-W
CASE NUMBER	7537	7573	7573	7508
CLP SAMPLE ID	BL-466	BK-460	BK-461	BJ-926
DATE SAMPLED	07/06/87	07/09/87	07/09/87	06/23/87
-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U	5.000 U	5.000 X	5.000 U
BENZENE	5.000 U	5.000 U	5.000 X	5.000 U
CIS-1,3-DICHLOROPROPENE	5.000 U	5.000 U	5.000 X	5.000 U
2-CHLOROETHYL VINYLETHER	10.000 U	10.000 U	10.000 X	10.000 U
BROMOFORM	5.000 U	5.000 U	5.000 X	5.000 U
4-METHYL-2-PENTANONE	10.000 U	10.000 U	10.000 X	10.000 U
2-HEXANONE	10.000 U	10.000 U	10.000 X	10.000 U
TETRACHLOROETHENE	5.000 U	5.000 U	5.000 X	5.000 U
1,1,2,2-TETRACHLOROETHANE	10.000 U	10.000 U	5.000 X	5.000 U
TOLUENE	5.000 U	5.000 U	1.000 X	5.000 U
CHLOROBENZENE	5.000 U	5.000 U	5.000 X	5.000 U
ETHYLBENZENE	5.000 U	5.000 U	5.000 X	5.000 U
STYRENE	5.000 U	5.000 U	5.000 X	5.000 U
TOTAL XYLEMES	5.000 U	5.000 U	5.000 X	5.000 U
TOTAL TICS	1.000	0.000	0.000	0.000
TIC CONCENTRATION	8.000 A	0.000 A	0.000 A	0.000 A

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
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 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ER0-W	ER0A-W	EROC-W	ER1-W	ER10A-W	ER11-W	ER3A-W
CASE NUMBER	7615	7615	7729	7537	7573	7508	7729
CLP SAMPLE ID	BK-468	BK-731	BK-694	BL-445	BK-461	BJ-926	BL-022
DATE SAMPLED	07/14/87	07/15/87	07/29/87	06/27/87	07/09/87	06/23/87	07/29/87
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PHENOL	.0.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BIS[2-CHLOROETHYL] ETHER	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2-CHLOROPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
1,3-DICHLOROBENZENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
1,4-DICHLOROBENZENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BENZYL ALCOHOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
1,2-DICHLOROBENZENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2-METHYLPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BIS[2-CHLOROISOPROPYL] ETHER	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
4-METHYLPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
N-NITROSO-DIISOPROPYLAMINE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
HEXACHLORETHANE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
NITROBENZENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
ISOPHORONE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2-NITROPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2,4-DIMETHYLPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BENZOIC ACID	50.000 U	50.000 U	50.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BIS[2-CHLOROETHOXY] METHANE	10.000 U	10.000 U	10.000 U	20.000 U	50.000 U	50.000 U	50.000 U
2,4-DICHLOROPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2,2,4-TRICHLOROBENZENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
NAPHTHALENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ER0-W	ER0A-W	ER0C-W	ER1-W	ER10A-W	ER11-W	ER3A-W
CASE NUMBER	7615	7615	7729	7537	7573	7508	7729
CLP SAMPLE ID	BK-468	BK-731	BK-694	BL-445	BK-461	BJ-926	BL-022
DATE SAMPLED	07/14/87	07/15/87	07/29/87	06/27/87	07/09/87	06/23/87	07/29/87
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4-CHLOROANILINE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
HEXAChLOROBUTADIENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
4-CHLORO-3-METHYLPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2-METNAPHTHALENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
HEXAChLCYCLOPENTADIENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2,4,6-TRICHLOROPHENOL	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2,4,5-TRICHLOROPHENOL	50.000 U	50.000 U	50.000 U	100.000 U	50.000 U	50.000 U	50.000 U
2-CHLORONAPHTHALENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2-NITROANILINE	50.000 U	50.000 U	50.000 U	100.000 U	50.000 U	50.000 U	50.000 U
DIMETHYL PHTHALATE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	50.000 U
ACENAPHTHYLENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
3-NITROANILINE	50.000 U	50.000 U	50.000 X	100.000 U	50.000 U	50.000 U	10.000 U
ACENAPHTHENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	50.000 U	50.000 X
2,4-DINITROPHENOL	50.000 U	50.000 U	50.000 U	100.000 U	10.000 U	10.000 U	10.000 U
4-NITROPHENOL	50.000 U	50.000 U	50.000 U	100.000 U	50.000 U	50.000 U	50.000 U
DIBENZOFURAN	10.000 U	10.000 U	50.000 U	100.000 U	50.000 U	50.000 U	50.000 U
2,4-DINITROTOLUENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
2,6-DINITROTOLUENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
DIETHYLPHthalate	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
4-CHLOROPHENYL PHENYL ETHER	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
FLUORENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
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EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

280 COONIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ER0-W	EROA-W	EROC-W	ER1-W	ER10A-W	ER11-W	ER3A-W
CASE NUMBER	7615	7615	7729	7537	7573	7508	7729
CLP SAMPLE ID	BK-468	BK-731	BK-694	BL-445	BK-461	BJ-926	BL-022
DATE SAMPLED	07/14/87	07/15/87	07/29/87	06/27/87	07/09/87	06/23/87	07/29/87
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4-NITROANILINE	50.000 U	50.000 U	50.000 U	50.000 X	50.000 U	50.000 U	50.000 U
4,6-DINITRO-2-METHYLPHENOL	50.000 U	50.000 U	50.000 U	100.000 U	50.000 U	50.000 U	50.000 U
N-NITROSODIPHENYLAMINE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
4-BROMOPHENYL PHENYL ETHER	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
HEXACHLOROBENZENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
PENTACHLOROPHENOL	50.000 U	50.000 U	50.000 U	100.000 U	50.000 U	50.000 U	50.000 U
PHENANTHRENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	50.000 U
ANTHRACENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
DI-n-BUTYLPHthalATE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
FLUORANTHRENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
PYRENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BUTYL BENZYL PHTHALATE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
3,3-DICHLOROBENZIDINE	20.000 U	20.000 U	20.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BENZO[a]ANTHRACENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	20.000 U	20.000 U
BIS[2-ETHYLHEXYL]PHTHALATE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
CHRYSENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	0.600 J
DI-n-OCTYL PHTHALATE	10.000 U	10.000 U	8.000 J	20.000 U	10.000 U	10.000 U	10.000 U
BENZO[b]FLUORANTHENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BENZO[k]FLUORANTHENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BENZO[a]PYRENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
INDENO[1,2,3-CD]PYRENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- E - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

1580 700 NIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ERO-W	EROA-W	EROC-W	ER1-W	ER10A-W	ER11-W	ER3A-W
CASE NUMBER	7615	7615	7729	7537	7573	7508	7729
CLP SAMPLE ID	BK-468	BK-731	BK-694	BL-445	BK-461	BJ-926	BL-022
DATE SAMPLED	07/14/87	07/15/87	07/29/87	06/27/87	07/09/87	06/23/87	07/29/87
	-----	-----	-----	-----	-----	-----	-----
DIBENZO[A,H]ANTHRACENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
BENZO[G,H,I]PERYLENE	10.000 U	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	10.000 U
TOTAL TICS	2.000	1.000	6.000	1.000	2.000	0.000	1.000
TIC CONCENTRATION	10.000 J	0.000 A	45.600	533.000 A	32.000 J	0.000 A	17.000

EXPLANATION OF CODES:

- - J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

X 580 600 NIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER4-W	ER6A-W	ER6A-WDUP	ER7-W	ER9-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7615	7615	7615	7537	7537	7573
CLP SAMPLE ID	BK-469	BK-736	BK-735	BK-732	BL-457	BL-447	BK-464
DATE SAMPLED	07/13/87	07/15/87	07/16/87	07/15/87	07/01/87	06/30/87	07/10/87
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PHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BIS[2-CHLOROETHYL] ETHER	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2-CHLOROPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
1,3-DICHLOROBENZENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
1,4-DICHLOROBENZENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BENZYL ALCOHOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
1,2-DICHLOROBENZENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2-METHYLPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BIS[2-CHLOROISOPROPYL] ETHER	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
4-METHYLPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
N-NITROSO-DIPIROPYLAMINE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
HEXACHLORETHANE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
NITROBENZENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
ISOPHORONE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2-NITROPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2,4-DIMETHYLPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BENZOIC ACID	50.000 U	50.000 U	50.000 U	50.000 U	20.000 U	20.000 U	10.000 U
BIS[2-CHLOROETHOXY] METHANE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	50.000 U
2,4-DICHLOROPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2,2,4-TRICHLOROBENZENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
NAPHTHALENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
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EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

5580 2020 A/I/A

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER4-W	ER6A-W	ER6A-WDUP	ER7-W	ER9-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7615	7615	7615	7537	7537	7573
CLP SAMPLE ID	BK-469	BK-736	BK-735	BK-732	BL-457	BL-447	BK-464
DATE SAMPLED	07/13/87	07/15/87	07/16/87	07/15/87	07/01/87	06/30/87	07/10/87
-----	-----	-----	-----	-----	-----	-----	-----
4-CHLOROANILINE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
HEXACHLOROBUTADIENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
4-CHLORO-3-METHYLPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2-METNAPHTHALENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
HEXAACL CYCLOPENTADIENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2,4,6-TRICHLOROPHENOL	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2,4,5-TRICHLOROPHENOL	50.000 U	50.000 U	50.000 U	50.000 U	20.000 U	20.000 U	10.000 U
2-CHLORONAPHTHALENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2-NITROANILINE	50.000 U	50.000 U	50.000 U	50.000 U	100.000 U	100.000 U	50.000 U
DIMETHYL PHTHALATE	10.000 U	10.000 U	10.000 U	10.000 U	100.000 U	100.000 U	50.000 U
ACENAPHTHYLENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
3-NITROANILINE	50.000 U	50.000 U	50.000 U	50.000 U	20.000 U	20.000 U	10.000 U
ACENAPHTHENE	10.000 U	10.000 U	10.000 U	10.000 U	100.000 U	100.000 U	50.000 U
2,4-DINITROPHENOL	50.000 U	50.000 U	50.000 U	50.000 U	20.000 U	20.000 U	10.000 U
4-NITROPHENOL	50.000 U	50.000 U	50.000 U	50.000 U	100.000 U	100.000 U	50.000 U
DI BENZOFURAN	10.000 U	10.000 U	10.000 U	10.000 U	100.000 U	100.000 U	50.000 U
2,4-DINITROTOLUENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
2,6-DINITROTOLUENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
DIETHYL PHTHALATE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
4-CHLOROPHENYL PHENYL ETHER	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
FLUORENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

4580 COONIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER4-W	ER6A-W	ER6A-WDUP	ER7-W	ER9-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7615	7615	7615	7537	7537	7573
CLP SAMPLE ID	BK-469	BK-736	BK-735	BK-732	BL-457	BL-447	BK-464
DATE SAMPLED	07/13/87	07/15/87	07/16/87	07/15/87	07/01/87	06/30/87	07/10/87
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4-NITROANILINE	50.000 U	50.000 U	50.000 U	50.000 U	100.000 U	100.000 U	50.000 U
4,6-DINITRO-2-METHYLPHENOL	50.000 U	50.000 U	50.000 U	50.000 U	100.000 U	100.000 U	50.000 U
N-NITROSDIPHENYLAMINE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
4-BROMOPHENYL PHENYL ETHER	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
HEXACHLOROBENZENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
PENTACHLOROPHENOL	50.000 U	50.000 U	50.000 U	50.000 U	20.000 U	20.000 U	10.000 U
PHENANTHRENE	10.000 U	10.000 U	10.000 U	10.000 U	100.000 U	100.000 U	50.000 U
ANTHRACENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
DI-n-BUTYLPHthalate	2.000 J	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
FLUORANTHRENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
PYRENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BUTYL BENZYL PHTHALATE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
3,3-DICHLOROBENZIDINE	20.000 U	20.000 U	20.000 U	20.000 U	20.000 U	20.000 U	10.000 U
BENZO[a]ANTHRACENE	10.000 U	10.000 U	10.000 U	10.000 U	40.000 U	40.000 U	20.000 U
BIS[2-ETHYLHEXYL]PHTHALATE	29.000 B	10.000 X	10.000 X	10.000 X	20.000 U	20.000 U	10.000 U
CHRYSENE	10.000 U	10.000 U	10.000 U	10.000 U	2.000 J	6.000 J	10.000 U
DI-n-OCTYL PHTHALATE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BENZO[b]FLUORANTHENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BENZO[k]FLUORANTHENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BENZO[a]PYRENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
INDENO[1,2,3-CD]PYRENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

5580-800NIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 BNA ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER4-W	ER6A-W	ER6A-WDUP	ER7-W	ER9-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7615	7615	7615	7537	7537	7573
CLP SAMPLE ID	BK-469	BK-736	BK-735	BK-732	BL-457	BL-447	BK-464
DATE SAMPLED	07/13/87	07/15/87	07/16/87	07/15/87	07/01/87	06/30/87	07/10/87
	-----	-----	-----	-----	-----	-----	-----
DIBENZO[A,H]ANTHRACENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
BENZO[G,H,I]PERYLENE	10.000 U	10.000 U	10.000 U	10.000 U	20.000 U	20.000 U	10.000 U
TOTAL TICS	2.000	2.000	1.000	2.000	2.000	2.000	1.000
TIC CONCENTRATION	60.000 J	10.000 J	0.000 A	10.000 J	281.000 A	309.000 A	108.000 J

EXPLANATION OF CODES:

- - J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
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 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ERO-W	EROA-W	EROC-W	ER1-W	ER3A-W	ER4-W	ER6A-W
CASE NUMBER	7615	7615	7729	7537	7729	7615	7615
CLP SAMPLE ID	BK-468	BK-731	BK-694	BL-445	BL-022	BK-469	BK-736
DATE SAMPLED	07/14/87	07/15/87	07/29/87	06/27/87	07/29/87	07/13/87	07/15/87
-----	-----	-----	-----	-----	-----	-----	-----
ALPHA-BHC	0.050 U						
BETA-BHC	0.050 U						
DELTA-BHC	0.050 U						
GAMMA-BHC	0.050 U						
HEPTACHLOR	0.050 U						
ALDRIN	0.050 U						
HEPTACHLOR EPOXIDE	0.050 U						
ENDOSULFAN I	0.050 U						
DIELDRIN	0.100 U	0.100 U	0.100 U	0.100 U	0.050 U	0.050 U	0.050 U
4-4-DDE	0.100 U						
ENDRIN	0.100 U						
ENDOSULFAN II	0.100 U						
4-4-DDD	0.100 U						
ENDOSULFAN SULFATE	0.100 U						
4-4-DDT	0.100 U						
METHOXYCHLOR	0.500 U						
ENDRIN KETONE	0.100 U						
CHLORDANE	0.500 U						
TOXAPHENE	1.000 U						
AROCHLOR 1016	0.500 U						
AROCHLOR 1221	0.500 U						

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

1586 200 NIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ERO-W	EROA-W	EROC-W	ER1-W	ER3A-W	ER4-W	ER6A-W
CASE NUMBER	7615	7615	7729	7537	7729	7615	7615
CLP SAMPLE ID	BK-468	BK-731	BK-694	BL-445	BL-022	BK-469	BK-736
DATE SAMPLED	07/14/87	07/15/87	07/29/87	06/27/87	07/29/87	07/13/87	07/15/87
-----	-----	-----	-----	-----	-----	-----	-----
AROCHLOR 1232	0.500 U						
AROCHLOR 1242	0.500 U						
AROCHLOR 1248	0.500 U						
AROCHLOR 1254	1.000 U	1.000 U	1.000 U	0.500 U	0.500 U	0.500 U	0.500 U
AROCHLOR 1260	1.000 U						

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- D - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

Q580 TOO NIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER6A-WDUP	ER7-W	ER9-W	ER9D-W	ER9E-W	ER10A-W	ER11-W
CASE NUMBER	7615	7615	7537	7537	7573	7573	
CLP SAMPLE ID	BK-735	BK-732	BL-457	BL-447	BK-464	BK-461	7508
DATE SAMPLED	07/16/87	07/15/87	07/01/87	06/30/87	07/10/87	07/09/87	BJ-926
	-----	-----	-----	-----	-----	-----	06/23/87
ALPHA-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
BETA-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
DELTA-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
GAMMA-BHC	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
HEPTACHLOR	0.050 U	0.050 U	0.050 U	0.050 U	0.004 J	0.050 U	0.050 U
ALDRIN	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
HEPTACHLOR EPOXIDE	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
ENDOSULFAN I	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
DIELDRIN	0.100 U	0.100 U	0.100 U	0.100 U	0.050 U	0.050 U	0.050 U
4-4-DDE	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
ENDRIN	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
ENDOSULFAN II	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
4-4-DDD	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
ENDOSULFAN SULFATE	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
4-4-DDT	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
METHOXYCHLOR	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
ENDRIN KETONE	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
CHLORDANE	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
TOXAPHENE	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U
AROCHLOR 1016	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	1.000 U
AROCHLOR 1221	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- DETECTED AT CONCENTRATION SHOWN
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- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER6A-WDUP	ER7-W	ER9-W	ER9D-W	ER9E-W	ER10A-W	ER11-W
CASE NUMBER	7615	7615	7537	7537	7573	7573	7508
CLP SAMPLE ID	BK-735	BK-732	BL-457	BL-447	BK-464	BK-461	BJ-926
DATE SAMPLED	07/16/87	07/15/87	07/01/87	06/30/87	07/10/87	07/09/87	06/23/87
-----	-----	-----	-----	-----	-----	-----	-----
AROCHLOR 1232	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
AROCHLOR 1242	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
AROCHLOR 1248	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
AROCHLOR 1254	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U	0.500 U
AROCHLOR 1260	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U	1.000 U

EXPLANATION OF CODES:

-
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ER0-W	ER0A-W	ER0B-W	ER0C-W	ER1-W	ER2-W	ER3-W
CASE NUMBER	7615	7615	7537	7729	7537	7615	7573
CLP SAMPLE ID	MBJ-699	MBJ-702	MBI-544	MBJ-790	MBI-537	MBJ-708	MBJ-698
DATE SAMPLED	07/14/87	07/15/87	06/30/87	07/29/87	06/27/87	07/15/87	07/10/87
-----	-----	-----	-----	-----	-----	-----	-----
ALUMINUM	507.000	632.000	949.000	100.000 U	421.000	529.000	332.000
ANTIMONY	20.000 U	20.000 U	33.000 U	33.000 U	33.000 U	20.000 U	20.000 U
ARSENIC	10.000 X	2.200 J	6.000 U	6.000 U	6.000 U	2.500 J	61.000
BARIUM	89.000 J	67.000 J	68.000 J	148.000 J	105.000 J	84.000 J	111.000 J
BERYLLIUM	3.700 U	3.700 U	4.000 U	4.000 U	4.000 U	3.700 U	3.700 U
CADMIUM	3.600 U	3.600 U	4.000 U	4.000 U	4.600 J	3.600 U	3.600 U
CALCIUM	5000.000 X	5000.000 X	9230.000	4490.000 J	6380.000	5000.000 X	5430.000
CHROMIUM	7.600 U	7.600 U	9.000 U	9.000 U	9.000 U	7.600 U	9.700 J
COBALT	9.700 U	9.700 U	7.000 U	7.000 U	7.000 U	9.700 U	9.700 U
COPPER	17.000 J	25.000 J	17.000 U	35.000	27.000	18.000 J	27.000
IRON	2210.000	2080.000	3230.000	146.000	2310.000	1800.000	100.000 X
LEAD	5.000 X	5.000 X	5.000 X	5.000 X	29.400	5.000 X	7.500
CYANIDE	10.000 R						
MAGNESIUM	2650.000 J	2200.000 J	3440.000 J	2190.000 J	3290.000 J	2430.000 J	2480.000 J
MANGANESE	42.000	25.000	96.000	20.200 J	50.600	45.000	36.000
MERCURY	0.600	0.200 U	0.200 U	0.300	0.200 U	0.200 U	0.600
NICKEL	33.000 U	32.000 U	7.900 J	6.000 U	8.600 J	32.000 U	33.000 U
POTASSIUM	667.000 J	688.000 J	928.000	955.000 J	500.000 U	1100.000 J	1430.000 J
SELENIUM	5.000 X	0.500 U	2.000 U	2.000 U	2.000 U	0.500 U	1.300 J
SILVER	4.900 U	4.900 U	7.000 U	7.000 U	7.000 U	4.900 U	4.900 U
SODIUM	5000.000 X	5000.000 X	3580.000 J	8400.000	6300.000	5000.000 X	6620.000

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ER0-W	ER0A-W	ER0B-W	ER0C-W	ER1-W	ER2-W	ER3-W
CASE NUMBER	7615	7615	7537	7729	7537	7615	7573
CLP SAMPLE ID	MBJ-699	MBJ-702	MBI-544	MBJ-790	MBI-537	MBJ-708	MBJ-698
DATE SAMPLED	07/14/87	07/15/87	06/30/87	07/29/87	06/27/87	07/15/87	07/10/87
THALLIUM	10.000 X	0.600 U	8.000 U	8.000 U	8.000 U	1.300 J	0.600 U
VANADIUM	5.300 U	5.300 U	12.000 U	12.000 U	12.000 U	5.300 U	5.300 U
ZINC	20.000 X	20.000 X	20.000 X	74.100 J	40.400	20.000 X	20.000 X
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER3A-W	ER4-W	ER5-W	ER6-W	ER6A-W	ER6A-WDUP	ER7-W
CASE NUMBER	7729	7615	7508	7537	7615	7615	7615
CLP SAMPLE ID	MBJ-793	MBJ-700	MBJ-059	MBJ-534	MBJ-706	MBJ-705	MBJ-703
DATE SAMPLED	07/29/87	07/13/87	06/25/87	06/29/87	07/15/87	07/16/87	07/15/87
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ALUMINUM	100.000 U	506.000	240.000 J	100.000 U	324.000	353.000	405.000
ANTIMONY	33.000 U	20.000 U	30.000 U	33.000 U	20.000 U	20.000 U	20.000 U
ARSENIC	6200.000	153.000	570.000 J	6.000 U	4.500 J	4.400 J	10.000 X
BARIUM	96.900 J	66.000 J	200.000 X	53.000 J	68.000 J	71.000 J	66.000 J
BERYLLIUM	4.000 U	3.700 U	2.000 U	4.000 U	3.700 U	3.700 U	3.700 U
CADMIUM	4.000 U	3.600 U	5.000 U	4.000 U	3.600 U	3.600 U	3.600 U
CALCIUM	3600.000 J	5000.000 X	4100.000 J	3980.000 J	5000.000 X	5000.000 X	5000.000 X
CHROMIUM	9.000 U	7.600 U	10.000 U	9.000 U	7.600 U	7.600 U	7.600 U
COBALT	7.000 U	9.700 U	25.000 U	7.000 U	9.700 U	9.700 U	9.700 U
COPPER	20.900 J	15.000 J	15.000 U	17.000 U	19.000 J	18.000 J	17.000 J
IRON	124.000	100.000 X	100.000 X	817.000	1950.000	1990.000	1540.000
LEAD	5.000 X	5.000 X	50.000 U	3.740	5.000 X	5.000 X	5.000 X
CYANIDE	10.000 R						
MAGNESIUM	1650.000 J	1840.000 J	1600.000 J	2150.000 J	2090.000 J	2150.000 J	1840.000 J
MANGANESE	18.300 J	46.000	24.000 J	18.700	46.000	44.000	41.000
MERCURY	0.200 U	0.800	0.200 U	0.200 U	0.200 U	0.200	0.200
NICKEL	6.000 U	75.000	30.000 U	6.000 U	32.000 U	32.000 U	32.000 U
POTASSIUM	612.000 J	405.000 J	1600.000 J	639.000	845.000 J	1050.000 J	845.000 J
SELENIUM	2.000 U	5.000 X	5.000 U	2.000 U	0.500 U	2.400 J	0.500 U
SILVER	7.000 U	4.900 U	10.000 U	7.000 U	4.900 U	4.900 U	4.900 U
SODIUM	6500.000	5000.000 X	7200.000 J	4730.000 J	5000.000 X	5000.000 X	5000.000 X

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER3A-W	ER4-W	ER5-W	ER6-W	ER6A-W	ER6A-WDUP	ER7-W
CASE NUMBER	7729	7615	7508	7537	7615	7615	7615
CLP SAMPLE ID	MBJ-793	MBJ-700	MBJ-059	MBJ-534	MBJ-706	MBJ-705	MBJ-703
DATE SAMPLED	07/29/87	07/13/87	06/25/87	06/29/87	07/15/87	07/16/87	07/15/87
THALLIUM	8.000 U	10.000 X	5.000 U	8.000 U	0.600 U	0.600 U	0.600 U
VANADIUM	12.000 U	5.300 U	30.000 U	12.000 U	19.000 J	18.000 J	15.000 J
ZINC	65.100 J	20.000 X	21.000 J	8.000 J	20.000 X	20.000 X	20.000 X
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

-
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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 3

SAMPLE ID	ER7-W/DUP	ER8-W	ER9-W	ER9A-W	ER9C-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7537	7537	7573	7573	7537	7573
CLP SAMPLE ID	MBJ-704	MBI-536	MBJ-663	MBJ-691	MBJ-692	MBI-539	MBJ-696
DATE SAMPLED	07/15/87	06/27/87	07/01/87	07/09/87	07/09/87	06/30/87	07/10/87
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ALUMINUM	394.000	132.000 J	141.000 J	211.000	194.000 J	100.000 U	214.000
ANTIMONY	20.000 U	33.000 U	33.000 U	20.000 U	20.000 U	33.000 U	20.000 U
ARSENIC	10.000 X	10.000 X	6.000 U	123.000	150.000	6.000 U	146.000
BARIUM	66.000 J	57.500 J	128.000 J	69.000 J	69.000 J	48.000 J	77.000 J
BERYLLIUM	3.700 U	4.000 U	4.000 U	3.700 U	3.700 U	4.000 U	3.700 U
CADMIUM	3.600 U	4.000 U	4.000 U	3.600 U	3.600 U	4.000 U	3.600 U
CALCIUM	5000.000 X	3790.000 J	13100.000	5470.000	5160.000	4900.000 J	5660.000
CHROMIUM	7.700 J	9.000 U	9.000 U	7.600 U	7.600 U	9.000 U	9.300 J
COBALT	9.700 U	7.000 U	7.000 U	9.700 U	9.700 U	7.000 U	9.700 U
COPPER	15.000 J	17.000 U	17.000 U	21.000 J	15.000 J	17.000 U	11.000 U
IRON	1500.000	1020.000	356.000	100.000 X	100.000 X	719.000	100.000 X
LEAD	5.000 X	3.960	5.000 X	4.000 J	3.700 J	5.000 X	2.700 J
CYANIDE	10.000 R						
MAGNESIUM	1850.000 J	2090.000 J	4570.000 J	2250.000 J	2240.000 J	3210.000 J	2400.000 J
MANGANESE	40.000	24.300	34.000	37.000	40.000	41.000	42.000
MERCURY	0.200	0.200 U	0.200 U	0.400	0.300	0.200 U	0.300
NICKEL	32.000 U	6.000 U	26.000 J	33.000 U	33.000 U	6.000 U	33.000 U
POTASSIUM	823.000 J	642.000	2340.000	1230.000 J	1660.000 J	500.000 U	1470.000 J
SELENIUM	0.500 J	2.000 U	2.000 U	0.500 U	0.500 U	2.000 U	0.500 U
SILVER	4.900 U	7.000 U	7.000 U	4.900 U	4.900 U	7.000 U	4.900 U
SODIUM	5000.000 X	6300.000	20900.000	6780.000	8120.000	4440.000 J	8070.000

EXPLANATION OF CODES:

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 3 (CONT.)

SAMPLE ID	ER7-WDUP	ER8-W	ER9-W	ER9A-W	ER9C-W	ER9D-W	ER9E-W
CASE NUMBER	7615	7537	7537	7573	7573	7537	7573
CLP SAMPLE ID	MBJ-704	MBI-536	MBJ-663	MBJ-691	MBJ-692	MBI-539	MBJ-696
DATE SAMPLED	07/15/87	06/27/87	07/01/87	07/09/87	07/09/87	06/30/87	07/10/87
THALLIUM	0.600 U	8.000 U	8.000 U	0.600 U	0.600 U	8.000 U	0.600 U
VANADIUM	14.000 J	12.000 U	12.000 U	6.600 J	5.300 U	12.000 U	6.900 J
ZINC	20.000 X	23.100	20.000 X				
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

- - - - -
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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 4

SAMPLE ID	ER9F-W	ER10-W	ER10A-W	ER11-W	ER20-W	ER21-W	ER22-W
CASE NUMBER	7615	7573	7573	7508	7782	7782	7782
CLP SAMPLE ID	MBJ-671	MBJ-693	MBJ-694	MBJ-457	MBJ-800	MBJ-801	MBJ-802
DATE SAMPLED	07/06/87	07/09/87	07/09/87	06/23/87	08/04/87	08/04/87	08/04/87
ALUMINUM	240.000	164.000 J	163.000 J	100.000 U	465.000	502.000	191.000 J
ANTIMONY	20.000 U	20.000 U	20.000 U	30.000 U	3.000 U	3.000 U	3.000 U
ARSENIC	105.000	125.000	102.000	5.000 U	79.700	91.000	89.000
BARIUM	65.000 J	67.000 J	85.000 J	200.000 X	72.000 J	69.000 J	51.000 J
BERYLLIUM	3.700 U	3.700 U	3.700 U	2.000 U	2.100 U	2.100 U	2.100 U
CADMIUM	3.600 U	3.600 U	3.600 U	5.000 U	5.000 X	5.000 X	5.000 X
CALCIUM	5000.000 X	5580.000	5560.000	11300.000	3350.000 J	3170.000 J	3710.000 J
CHROMIUM	13.000	7.600 U	7.600 U	14.000	9.400 U	9.400 U	9.400 U
COBALT	9.700 U	9.700 U	9.700 U	25.000 U	38.000 U	38.000 U	38.000 U
COPPER	14.000 J	11.000 U	11.000 J	15.000 U	16.000 U	16.000 U	16.000 U
IRON	1850.000	100.000 X	4.000 X	100.000 X	2540.000 J	2670.000 J	2210.000 J
LEAD	5.000 X	3.800 J	2.300 J	500.000 U	10.000	7.700	4.000 J
CYANIDE	10.000 R						
MAGNESIUM	2600.000 J	2540.000 J	2570.000 J	4100.000 J	2460.000 J	2520.000 J	2420.000 J
MANGANESE	47.000	47.000	52.000	129.000 J	100.000	97.000	74.000
MERCURY	0.500	0.200 U					
NICKEL	43.000	33.000 U	33.000 U	30.000 U	28.000 U	28.000 U	28.000 U
POTASSIUM	770.000 J	1800.000 J	1890.000 J	8900.000	2230.000 J	2220.000 J	1890.000 J
SELENIUM	0.500 U	0.500 U	0.850 J	5.000 U	5.000 X	5.000 X	5.000 X
SILVER	4.900 U	4.900 U	4.900 U	10.000 U	19.000	7.700 U	7.700 U
SODIUM	5000.000 X	8190.000	8860.000	85600.000	9890.000	8300.000	8670.000

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 4 (CONT.)

SAMPLE ID	ER9F-W	ER10-W	ER10A-W	ER11-W	ER20-W	ER21-W	ER22-W
CASE NUMBER	7615	7573	7573	7508	7782	7782	7782
CLP SAMPLE ID	MBJ-671	MBJ-693	MBJ-694	MBJ-457	MBJ-800	MBJ-801	MBJ-802
DATE SAMPLED	07/06/87	07/09/87	07/09/87	06/23/87	08/04/87	08/04/87	08/04/87
THALLIUM	10.000 X	0.600 J	0.600 U	5.000 U	10.000 X	10.000 X	10.000 X
VANADIUM	6.500 J	5.300 U	5.300 U	30.000 U	47.000 J	23.000 U	23.000 U
ZINC	20.000 X	20.000 X	20.000 X	10.000	20.000 X	20.000 X	20.000 X
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
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SAMPLE ID	ER23-W	ER26-W	ER27-W	ER29-W	ER32-W	ER32-WDUP	ER37-W
CASE NUMBER	7782	7782	7782	7782	7782	7782	7782
CLP SAMPLE ID	MBJ-803	MBJ-804	MBJ-805	MBJ-806	MBJ-807	MBJ-808	MBJ-809
DATE SAMPLED	08/04/87	08/04/87	08/04/87	08/04/87	08/04/87	08/04/87	08/04/87
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ALUMINUM	1110.000	711.000	458.000	918.000	631.000	656.000	739.000
ANTIMONY	3.000 U	3.000 U	3.000 U				
ARSENIC	10.000 X	73.000	82.000	50.000	52.000	44.000	18.000
BARIUM	72.000 J	60.000 J	51.000 J	48.000 J	43.000 J	44.000 J	49.000 J
BERYLLIUM	2.100 U	2.100 U	2.100 U				
CADMIUM	5.000 X	5.000 X	5.000 X				
CALCIUM	3520.000 J	3380.000 J	3530.000 J	5050.000	6260.000	6320.000	28800.000
CHROMIUM	9.400 U	9.400 U	13.000				
COBALT	38.000 U	38.000 U	38.000 U				
COPPER	16.000 U	16.000 U	25.000 J				
IRON	3660.000 J	2870.000 J	2440.000 J	2750.000 J	2430.000 J	2550.000 J	2010.000 J
LEAD	9.400	6.900	5.600	5.000 U	2.900 U	3.300	2.900 U
CYANIDE	10.000 R	10.000 R	10.000 R				
MAGNESIUM	2700.000 J	2780.000 J	3150.000 J	7350.000 J	12000.000 J	12300.000 J	82500.000 J
MANGANESE	101.000	90.000	82.000	74.000	71.000	73.000	106.000
MERCURY	0.200 U	0.200 U	0.200 U				
NICKEL	28.000 U	28.000 U	28.000 U				
POTASSIUM	2400.000 J	2350.000 J	2340.000 J	3690.000 J	5110.000	5260.000	24800.000
SELENIUM	5.000 X	5.000 X	5.000 X				
SILVER	7.700 U	7.700 U	35.000				
SODIUM	9580.000	11000.000	15300.000	57200.000	138000.000	138000.000	993000.000

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 5 (CONT.)

SAMPLE ID	ER23-W	ER26-W	ER27-W	ER29-W	ER32-W	ER32-WDUP	ER37-W
CASE NUMBER	7782	7782	7782	7782	7782	7782	7782
CLP SAMPLE ID	MBJ-803	MBJ-804	MBJ-805	MBJ-806	MBJ-807	MBJ-808	MBJ-809
DATE SAMPLED	08/04/87	08/04/87	08/04/87	08/04/87	08/04/87	08/04/87	08/04/87
THALLIUM	10.000 X	10.000 X					
VANADIUM	32.000 J	23.000 U	39.000 J	23.000 U	23.000 U	23.000 U	60.000
ZINC	20.000 X	20.000 X					
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

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7620 700NIN

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 6

SAMPLE ID	ER38-W	ER39-W	ER40-W	ER43-W	ER44-W	ER45-W	ER50-W
CASE NUMBER	7782	7782	7782	7782	7782	7782	7782
CLP SAMPLE ID	MBJ-810	MBJ-811	MBJ-812	MBJ-813	MBJ-814	MBJ-815	MBL-243
DATE SAMPLED	08/04/87	08/05/87	08/05/87	08/05/87	08/05/87	08/06/87	08/05/87
ALUMINUM	384.000	293.000	421.000	675.000	793.000	600.000	802.000
ANTIMONY	3.000 U	3.000 U	3.000 U	3.000 U	18.000	38.000	3.000 U
ARSENIC	12.000	25.000	18.000	13.000	12.000	8.000 J	2.800 J
BARIUM	43.000 J	40.000 J	40.000 J	41.000 J	36.000 J	32.000 J	30.000 U
BERYLLIUM	2.100 U	2.100 U	2.100 U	2.100 U	2.100 U	2.100 U	2.400 J
CADMIUM	5.000 X	5.000 X	5.000 X	5.000 X	5.000 X	5.000 X	5.000 X
CALCIUM	51700.000	23600.000	30100.000	52600.000	88700.000	119000.000	207000.000
CHROMIUM	23.000	9.400 U	9.400 U	27.000	49.000	55.000	56.000
COBALT	38.000 U	38.000 U	38.000 U	38.000 U	38.000 U	38.000 U	51.000
COPPER	25.000 J	16.000 U	16.000 U	28.000	16.000 U	29.000	87.000
IRON	951.000 J	1260.000 J	1190.000 J	1410.000 J	1250.000 J	816.000 J	799.000
LEAD	2.900 U	2.900 U	2.900 U	2.900 U	2.900 U	2.900 U	2.900 U
CYANIDE	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R
MAGNESIUM	169000.000 J	70800.000 J	92900.000 J	165000.000 J	280000.000 J	368000.000 J	591000.000
MANGANESE	94.000	90.000	94.000	109.000	105.000	98.000	56.000
MERCURY	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
NICKEL	51.000	28.000 U	28.000 U	40.000	40.000 X	77.000	105.000
POTASSIUM	55500.000	23900.000	31400.000	55100.000	98200.000	134000.000	232000.000
SELENIUM	5.000 X	5.000 X	5.000 X	5.000 X	5.000 X	5.000 X	5.000 X
SILVER	10.000	7.700 U	7.700 U	9.600 J	14.000	17.000	17.000
SODIUM	1560000.000	632000.000	818000.000	1560000.000	2890000.000	4320000.000	6092000.000

EXPLANATION OF CODES:

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1280 700 NIA

VINELAND CHEMICAL COMPANY SITE
 SURFACE WATER SAMPLES
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 6 (CONT.)

SAMPLE ID	ER38-W	ER39-W	ER40-W	ER43-W	ER44-W	ER45-W	ER50-W
CASE NUMBER	7782	7782	7782	7782	7782	7782	7782
CLP SAMPLE ID	MBJ-810	MBJ-811	MBJ-812	MBJ-813	MBJ-814	MBJ-815	MBL-243
DATE SAMPLED	08/04/87	08/05/87	08/05/87	08/05/87	08/05/87	08/06/87	08/05/87
THALLIUM	10.000 X						
VANADIUM	23.000 U	28.000 J	32.000 J	23.000 U	23.000 U	23.000 U	23.000 U
ZINC	20.000 X						
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

- - - - -
- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

7/80 200 NIA

VINELAND CHEMICAL COMPANY SITE
SURFACE WATER SAMPLES
INORGANIC ANALYSES
(UG/L)

DATE: 05/10/88
PAGE 7

SAMPLE ID ER51-W
CASE NUMBER 7782
CLP SAMPLE ID MBL-244
DATE SAMPLED 08/06/87

ALUMINUM	402.000
ANTIMONY	26.000 J
ARSENIC	2.700 J
BARIUM	30.000 U
BERYLLOLUM	2.400 J
CADMIUM	5.000 X
CALCIUM	200000.000
CHROMIUM	48.000
COBALT	66.000
COPPER	40.000 J
IRON	282.000
LEAD	2.900 U
CYANIDE	10.000 R
MAGNESIUM	566000.000
MANGANESE	61.000
MERCURY	0.200 U
NICKEL	112.000
POTASSIUM	225000.000
SELENIUM	5.000 X
SILVER	13.000
SODIUM	588000.000

EXPLANATION OF CODES:

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A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

E680 MR NIA

VINELAND CHEMICAL COMPANY SITE
SURFACE WATER SAMPLES
INORGANIC ANALYSES
(UG/L)

DATE: 05/10/88
PAGE 7 (CONT.)

SAMPLE ID ER51-W
CASE NUMBER 7782
CLP SAMPLE ID MBL-244
DATE SAMPLED 08/06/87

THALLIUM 10.000 X
VANADIUM 23.000 U
ZINC 20.000 X

SOLIDS (%) 0.000

EXPLANATION OF CODES:

J - ESTIMATED VALUE
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VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 1

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ERO-A0	ER-0	A	0-1	07/14/87	1.000 UJ	5440.000	3990.000	0.00	0.00	0.00	0.00	0.00	EPTOX
ERO-A1	ER-0	A	1-2	07/14/87	10.000 X	8640.000	9880.000	13.10	63.30	14.70	7.80	98.90	
ERO-A2	ER-0	A	2-3	07/14/87	1.900 UJ	5330.000	103000.000	15.50	74.30	6.30	3.40	99.50	
ERO-B0	ER-0	B	0-1	07/14/87	1.100 J	3140.000	13800.000	4.20	89.90	3.60	2.20	99.90	INORG VOA PESPCB BNA
ERO-B1	ER-0	B	1-2	07/14/87	1.200 UJ	2240.000	12700.000	6.70	88.30	3.40	1.40	99.80	
ERO-B2	ER-0	B	2-3	07/14/87	1.000 UJ	597.000	7350.000	2.70	87.30	7.90	1.70	99.60	
ERO-B2DUP	ER-0	B	2-3	07/14/87	1.000 UJ	604.000	5390.000	0.90	85.30	11.20	2.20	99.60	
EROA-A0	ER-0A	A	0-1	07/14/87	1.000 UJ	747.000	11300.000	20.00	76.70	2.00	0.90	99.60	INORG BNA PESPCB VOA
EROA-A0DUP	ER-0A	A	0-1	07/14/87	4.600 UJ	4410.000	9860.000	35.40	64.50	0.00	0.00	99.90	
EROA-A1	ER-0A	A	1-2	07/14/87	1.000 UJ	1170.000	9780.000	34.40	63.30	1.60	0.60	99.90	
EROA-A2	ER-0A	A	2-3	07/14/87	0.900 UJ	100.000 X	1280.000	30.30	69.70	0.00	0.00	100.00	
EROA-B0	ER-0A	B	0-1	07/14/87	1.000 UJ	1250.000	2760.000	14.40	82.70	1.60	1.20	99.90	
EROA-B1	ER-0A	B	1-2	07/14/87	1.000 UJ	100.000 X	1060.000	6.60	91.10	1.00	1.20	99.90	
EROA-B2	ER-0A	B	2-3	07/14/87	1.000 UJ	350.000	1640.000	5.00	91.90	2.10	0.80	99.80	
EROB-A0	ER-0B	A	0-1	07/14/87	6.000 J	20900.000	40200.000	10.80	45.40	24.58	16.20	96.98	EPTOX
EROB-A1	ER-0B	A	1-2	07/14/87	2.200 UJ	5240.000	3200.000	8.10	80.10	7.94	2.68	98.82	
EROB-A2	ER-0B	A	2-3	07/14/87	2.400 UJ	3640.000	11000.000	12.40	78.90	4.58	3.82	99.70	
EROB-B0	ER-0B	B	0-1	07/14/87	10.000 X	18800.000	35400.000	20.70	63.60	5.99	4.15	94.44	INORG BNA PESPCB VOA
EROB-B1	ER-0B	B	1-2	07/14/87	2.600 UJ	7710.000	28400.000	25.10	62.00	8.47	3.68	99.25	
EROB-B2	ER-0B	B	2-3	07/14/87	2.200 UJ	1470.000	6500.000	5.00	90.20	2.99	1.67	99.86	
EROC-A0	ER-0C	A	0-1	07/14/87	3.910	4180.000	41600.000	11.20	84.60	2.17	1.68	99.65	INORG VOA BNA PESPCB
EROC-A0DUP	ER-0C	A	0-1	07/14/87	4.600	5820.000	0.000	0.00	0.00	0.00	0.00	INORG PESPCB BNA VOA	

EXPLANATION OF CODES:

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VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 2

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
EROC-A1	ER-OC	A	1-2	07/14/87	1.100 U	1920.000	10300.000	13.60	84.00	1.12	1.02	99.74	
EROC-A2	ER-OC	A	2-3	07/14/87	1.000 U	1710.000	6430.000	21.10	78.70	0.00	0.00	99.80	
EROC-B0	ER-OC	B	0-1	07/14/87	1.300 U	1630.000	34800.000	14.50	76.50	6.04	2.17	99.21	EPTOX
EROC-B1	ER-OC	B	1-2	07/14/87	3.200	2590.000	9200.000	20.70	76.00	2.15	0.84	99.69	
EROC-B2	ER-OC	B	2-3	07/14/87	1.000 U	1350.000	1190.000	38.60	61.40	0.00	0.00	100.00	
ER1-A0	ER-1	A	0-1	07/14/87	7.840	6330.000	22500.000	2.80	87.00	6.05	3.75	99.60	INORG VOA BNA PESPCB
ER1-A1	ER-1	A	1-2	07/14/87	7.200 J	6040.000	7900.000	1.50	69.10	15.14	4.91	90.65	
ER1-A2	ER-1	A	2-3	07/14/87	2.200 UJ	3120.000	21600.000	17.60	79.70	1.38	1.10	99.78	
ER1-B0	ER-1	B	0-1	07/14/87	8.200 J	4940.000	111000.000	0.30	47.30	11.33	18.65	77.58	
ER1-B1	ER-1	B	1-2	07/14/87	14.000 UJ	5150.000	85300.000	8.20	29.50	38.79	23.42	99.91	
ER1-B2	ER-1	B	2-3	07/14/87	3.200 UJ	2230.000	59800.000	44.10	39.00	4.46	11.27	98.83	
ER2-A0	ER-2	A	0-1	07/14/87	3.500 UJ	4200.000	67800.000	10.10	75.60	6.00	5.00	96.70	
ER2-A0DUP	ER-2	A	0-1	07/14/87	2.800 UJ	3540.000	55900.000	5.90	78.80	7.70	4.00	96.40	
ER2-A1	ER-2	A	1-2	07/14/87	1.600 UJ	2230.000	11700.000	6.30	85.10	4.20	3.70	99.30	
ER2-A2	ER-2	A	2-3	07/14/87	1.000 UJ	920.000	3300.000	12.00	87.90	0.00	0.00	99.90	
ER2-B0	ER-2	B	0-1	07/14/87	11.000 J	7030.000	173000.000	4.10	59.50	22.30	11.00	96.90	
ER2-B1	ER-2	B	1-2	07/14/87	3.500 J	2030.000	40100.000	7.50	88.50	1.60	2.00	99.60	
ER2-B2	ER-2	B	2-3	07/14/87	1.100 UJ	100.000 X	16400.000	2.10	97.80	0.00	0.00	99.90	
ER3-A0	ER-3	A	0-1	07/14/87	10.000 X	913.000	6690.000	0.30	99.80	0.00	0.00	100.10	EPTOX
ER3-A1	ER-3	A	1-2	07/14/87	10.000 X	350.000	18800.000	0.10	96.80	1.20	1.80	99.90	
ER3-A2	ER-3	A	2-3	07/14/87	10.000 X	100.000 X	1470.000	0.10	100.00	0.00	0.00	100.10	
ER3-A2DUP	ER-3	A	2-3	07/14/87	10.000 X	100.000 X	2280.000	0.10	99.90	0.00	0.00	100.00	

EXPLANATION OF CODES:

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R - NOT REQUIRED FOR ANALYSIS

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(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

KSO - COONIA

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 3

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER3-B0	ER-3	B	0-1	07/14/87	407.000	100.000 X	48300.000	1.30	94.40	1.30	2.50	99.50	
ER3-B1	ER-3	B	1-2	07/14/87	200.000	100.000 X	21400.000	0.20	97.10	0.90	1.60	99.80	
ER3-B2	ER-3	B	2-3	07/14/87	128.000	100.000 X	21300.000	0.50	97.00	1.00	1.60	100.10	
ER3A-A0	ER-3A	A	0-1	07/14/87	864.000 J	3100.000	118000.000	3.20	84.30	5.86	5.26	98.62	EPTOX
ER3A-A1	ER-3A	A	1-2	07/14/87	3040.000 J	7.500	174000.000	16.60	72.10	3.77	4.80	97.27	
ER3A-A2	ER-3A	A	2-3	07/14/87	3740.000 J	8250.000	170000.000	14.70	69.80	6.78	5.91	97.19	
ER3A-B0	ER-3A	B	0-1	07/14/87	3760.000 J	12800.000	232000.000	0.00	19.20	55.88	24.93	100.01	
ER3A-B1	ER-3A	B	1-2	07/14/87	6809.000 J	13800.000	349000.000	21.60	54.60	9.88	13.50	99.58	
ER3A-B2	ER-3A	B	2-3	07/14/87	5560.000 J	12300.000	255000.000	17.60	64.10	8.48	8.15	98.33	
ER4-A0	ER-4	A	0-1	07/14/87	0.000	0.000	36100.000	2.10	87.70	4.20	5.70	99.70	
ER4-A1	ER-4	A	1-2	07/14/87	39.000 J	802.000	22300.000	1.50	93.90	2.20	2.20	99.80	
ER4-A2	ER-4	A	2-3	07/14/87	18.000 J	100.000 X	47800.000	12.70	76.60	5.00	5.00	99.30	
ER4-B0	ER-4	B	0-1	07/14/87	7.700 J	10.000 X	9840.000	9.50	90.50	0.00	0.00	100.00	INORG VOA BNA PESPCB
ER4-B1	ER-4	B	1-2	07/14/87	226.000	763.000	20900.000	4.90	93.40	1.20	1.30	100.80	
ER4-C0	ER-4	C	0-1	07/14/87	229.000	2970.000	36300.000	22.10	68.30	4.90	4.70	100.00	EPTOX
ER4-C1	ER-4	C	1-2	07/14/87	10.000 X	1600.000	59500.000	25.10	69.80	2.80	2.00	99.70	
ER4-C2	ER-4	C	2-3	07/14/87	106.000	1580.000	21300.000	16.80	83.30	0.00	0.00	100.10	
ER5-A0	ER-5	A	0-1	07/14/87	41.000 J	242.000	8270.000	7.50	89.60	1.00	1.70	99.80	
ER5-A1	ER-5	A	1-2	07/14/87	27.100	112.000	9880.000	25.30	74.20	0.20	0.30	100.00	
ER5-A2	ER-5	A	2-3	07/14/87	17.800	104.000	4090.000	6.20	92.90	0.20	0.50	99.80	
ER5-B0	ER-5	B	0-1	07/14/87	33.000 J	238.000	3860.000	1.40	93.10	4.50	0.60	99.60	
ER5-B1	ER-5	B	1-2	07/14/87	18.500	152.000	3260.000	2.10	96.20	1.10	0.60	100.00	

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

LL80 700N1A

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 4

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER6-A0	ER-6	A	0-1	07/14/87	3.000 U	435.000	49100.000	1.60	92.10	2.42	3.63	99.75	INORG PESPCB BNA VOA
ER6-A1	ER-6	A	1-2	07/14/87	3.300 UJ	250.000	13600.000	2.40	94.50	0.91	2.03	99.84	
ER6-A2	ER-6	A	2-3	07/14/87	4.000 UJ	260.000	7600.000	1.01	95.10	1.84	1.90	99.85	
ER6-B0	ER-6	B	0-1	07/14/87	2.300 UJ	80.000 J	24000.000	0.50	99.40	0.00	0.00	99.90	EPTOX
ER6-B1	ER-6	B	1-2	07/14/87	2.300 UJ	60.000 J	4600.000	1.60	98.40	0.00	0.00	100.00	
ER6-B2	ER-6	B	2-3	07/14/87	2.200 UJ	150.000	9100.000	7.70	92.40	0.00	0.00	100.10	
ER6A-A0	ER-6A	A	0-1	07/14/87	1.700 UJ	2480.000	31400.000	1.30	92.80	2.50	2.60	99.20	
ER6A-A0DUP	ER-6A	A	0-1	07/14/87	1.000 U	382.000	32300.000	1.30	92.50	2.60	3.20	99.60	
ER6A-A1	ER-6A	A	1-2	07/14/87	1.300 UJ	725.000	18000.000	0.80	95.00	1.70	2.20	99.70	
ER6A-A2	ER-6A	A	2-3	07/14/87	1.200 UJ	568.000	6450.000	0.10	99.90	0.00	0.00	100.00	
ER6A-B0	ER-6A	B	0-1	07/14/87	1.900 UJ	677.000	45100.000	1.70	87.20	5.10	3.40	97.40	INORG EPTOX BNA PESPCB VOA
ER6A-B0DUP	ER-6A	B	0-1	07/14/87	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	EPTOX
ER6A-B1	ER-6A	B	1-2	07/14/87	1.400 UJ	100.000 X	19100.000	1.70	93.90	1.60	1.50	98.70	
ER6A-B2	ER-6A	B	2-3	07/14/87	1.000 UJ	100.000 X	6750.000	5.60	94.30	0.00	0.00	99.90	
ER7-A0	ER-7	A	0-1	07/14/87	31.000 J	480.000	9440.000	15.80	81.90	0.90	1.30	99.90	EPTOX
ER7-A1	ER-7	A	1-2	07/14/87	41.000 J	337.000	4160.000	45.50	54.50	0.00	0.00	100.00	
ER7-A2	ER-7	A	2-3	07/14/87	19.000 J	320.000	2490.000	24.00	76.00	0.00	0.00	100.00	
ER7-B0	ER-7	B	0-1	07/14/87	1.000 J	100.000 X	1770.000	50.50	49.50	0.00	0.00	100.00	INORG BNA PESPCB VOA
ER7-B1	ER-7	B	1-2	07/14/87	0.900 UJ	100.000 X	1310.000	33.60	66.40	0.00	0.00	100.00	
ER7-B2	ER-7	B	2-3	07/14/87	0.900 UJ	100.000 X	1240.000	32.40	67.70	0.00	0.00	100.10	
ER7-C0	ER-7	C	0-1	07/14/87	1.000 UJ	274.000	1930.000	13.90	86.00	0.00	0.00	99.90	
ER7-CODUP	ER-7	C	0-1	07/14/87	0.900 UJ	100.000 X	1890.000	32.10	68.00	0.00	0.00	100.10	

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

SC80 COONIA

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 5

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER7-C1	ER-7	C	1-2	07/14/87	14.000 J	384.000	6000.000	50.30	49.70	0.00	0.00	100.00	
ER7-C2	ER-7	C	2-3	07/14/87	6.100 J	308.000	4300.000	25.90	74.20	0.00	0.00	100.10	
ER8-A0	ER-8	A	0-1	07/14/87	12.200 J	2200.000	8300.000	5.70	93.00	0.00	0.00	98.70	EPTOX
ER8-A1	ER-8	A	1-2	07/14/87	5.600 J	800.000	10100.000	4.90	94.40	0.00	0.00	99.30	
ER8-A2	ER-8	A	2-3	07/14/87	5.700 J	600.000	9900.000	10.90	89.10	0.00	0.00	100.00	
ER8-B0	ER-8	B	0-1	07/14/87	15.000 J	350.000	2960.000	1.10	98.90	0.00	0.00	100.00	
ER8-B1	ER-8	B	1-2	07/14/87	12.000 J	210.000	9900.000	0.80	99.10	0.00	0.00	99.90	
ER8-B2	ER-8	B	2-3	07/14/87	10.000 X	320.000	6900.000	2.10	97.90	0.00	0.00	100.00	
ER9-A0	ER-9	A	0-1	07/14/87	10.000 X	2360.000	18200.000	5.10	94.80	0.00	0.00	99.90	INORG PESPCB BNA VOA
ER9-A1	ER-9	A	1-2	07/14/87	2.000 UJ	214.000	6000.000	1.10	98.90	0.00	0.00	100.00	
ER9-A1DUP	ER-9	A	1-2	07/14/87	2.000 UJ	329.000	3200.000	0.80	99.00	0.00	0.00	99.80	
ER9-A2	ER-9	A	2-3	07/14/87	2.000 UJ	304.000	580.000	1.20	98.60	0.00	0.00	99.80	
ER9-B0	ER-9	B	0-1	07/14/87	2.200 UJ	841.000	19100.000	4.80	95.10	0.00	0.00	99.90	EPTOX
ER9-B0DUP	ER-9	B	0-1	07/14/87	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	EPTOX
ER9-B1	ER-9	B	1-2	07/14/87	2.000 UJ	606.000	1600.000	2.80	97.30	0.00	0.00	100.10	
ER9-B2	ER-9	B	2-3	07/14/87	2.000 UJ	2120.000	1600.000	6.00	94.00	0.00	0.00	100.00	
ER9A-A0	ER-9A	A	0-1	07/14/87	258.000	9026.000	38700.000	6.40	72.20	10.70	10.20	99.50	
ER9A-A1	ER-9A	A	1-2	07/14/87	22.300	973.000	1880.000	53.00	47.10	0.00	0.00	100.10	
ER9A-A2	ER-9A	A	2-3	07/14/87	153.000	2319.000	5580.000	43.80	56.30	0.00	0.00	100.10	
ER9A-B0	ER-9A	B	0-1	07/14/87	10.000	464.000	2540.000	2.30	97.70	0.00	0.00	100.00	
ER9A-B1	ER-9A	B	1-2	07/14/87	9.300	480.000	550.000	29.10	70.80	0.00	0.00	99.90	
ER9A-B2	ER-9A	B	2-3	07/14/87	41.000	3175.000	614.000	60.90	39.20	0.00	0.00	100.10	

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- DETECTED AT CONCENTRATION SHOWN
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- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

b6.8.2 T00N1A

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
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SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER9A-C0	ER-9A	C	0-1	07/14/87	8.500	481.000	533.000	42.90	57.00	0.00	0.00	99.90	
ER9A-C1	ER-9A	C	1-2	07/14/87	27.000	1390.000	28100.000	64.40	32.60	1.20	1.70	99.90	
ER9A-D0	ER-9A	D	0-1	07/14/87	13.000	383.000	0.000	16.50	83.30	0.00	0.00	99.80	
ER9A-D1	ER-9A	D	1-2	07/14/87	6.000	276.000	514.000	57.70	42.30	0.00	0.00	100.00	
ER9A-E0	ER-9A	E	0-1	07/14/87	64.000	1490.000	42900.000	7.40	79.40	5.90	5.30	98.00	EPTOX
ER9A-E1	ER-9A	E	1-2	07/14/87	4.800	159.000	7890.000	21.00	79.00	0.00	0.00	100.00	
ER9A-E2	ER-9A	E	2-3	07/14/87	1.000 U	69.000	2070.000	41.50	58.40	0.00	0.00	99.90	
ER9C-A0	ER-9C	A	0-1	07/14/87	43.000	813.000	2630.000	23.70	76.20	0.00	0.00	99.90	EPTOX
ER9C-A1	ER-9C	A	1-2	07/14/87	11.000	267.000	9720.000	18.90	81.10	0.00	0.00	100.00	
ER9C-A2	ER-9C	A	2-3	07/14/87	4.300	252.000	20700.000	6.00	91.70	1.10	1.00	99.80	
ER9C-B0	ER-9C	B	0-1	07/14/87	4.500	285.000	954.000	3.10	96.90	0.00	0.00	100.00	
ER9C-B1	ER-9C	B	1-2	07/14/87	5.200	409.000	961.000	6.70	93.30	0.00	0.00	100.00	
ER9C-B2	ER-9C	B	2-3	07/14/87	14.000	420.000	996.000	3.10	96.90	0.00	0.00	100.00	
ER9C-C0	ER-9C	C	0-1	07/14/87	13.000	304.000	476.000	13.20	86.70	0.00	0.00	99.90	
ER9C-C1	ER-9C	C	1-2	07/14/87	8.900	257.000	466.000	1.80	98.20	0.00	0.00	100.00	
ER9C-D0	ER-9C	D	0-1	07/14/87	4.700	799.000	1350.000	12.10	87.90	0.00	0.00	100.00	
ER9C-D1	ER-9C	D	1-2	07/14/87	3.400	552.000	1130.000	9.00	90.90	0.00	0.00	99.90	
ER9C-D2	ER-9C	D	2-3	07/14/87	2.400 J	210.000	791.000	14.90	85.10	0.00	0.00	100.00	
ER9C-E0	ER-9C	E	0-1	07/14/87	162.000	8830.000	33800.000	12.40	71.70	0.00	0.00	84.10	INORG PESPCB VOA BNA
ER9C-E1	ER-9C	E	1-2	07/14/87	10.000	1320.000	20100.000	2.40	94.40	1.10	1.90	99.80	
ER9C-E2	ER-9C	E	2-3	07/14/87	8.400	443.000	5900.000	17.60	82.30	0.00	0.00	99.90	
ER9D-A0	ER-9D	A	0-1	07/14/87	10.000 X	2840.000	13100.000	25.30	70.10	1.40	2.92	99.72	INORG PESPCB VOA BNA
ER9D-A1	ER-9D	A	1-2	07/14/87	2.600 UJ	1210.000	4100.000	23.10	75.50	0.00	0.00	98.60	

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

08862 700A/IA

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 7

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER9D-A2	ER-9D	A	2-3	07/14/87	2.200 UJ	1260.000	4700.000	31.40	68.50	0.00	0.00	99.90	
ER9D-B0	ER-9D	B	0-1	07/14/87	3.200 UJ	690.000	14400.000	4.60	92.20	0.72	2.29	99.81	EPTOX
ER9D-B1	ER-9D	B	1-2	07/14/87	2.100 UJ	260.000	10000.000	1.60	97.70	0.00	0.00	99.30	
ER9D-B2	ER-9D	B	2-3	07/14/87	2.100 UJ	200.000	11000.000	1.10	98.80	0.00	0.00	99.90	
ER9E-A0	ER-9E	A	0-1	07/14/87	63.000	5360.000	25600.000	1.80	89.30	3.30	5.50	99.90	INORG PESPCB VOA BNA
ER9E-A1	ER-9E	A	1-2	07/14/87	23.000	1800.000	14500.000	0.60	95.00	1.90	2.30	99.80	
ER9E-A2	ER-9E	A	2-3	07/14/87	18.000	1390.000	7980.000	0.10	97.30	1.10	1.40	99.90	
ER9E-B0	ER-9E	B	0-1	07/14/87	1.700 J	599.000	602.000	0.00	100.10	0.00	0.00	100.10	
ER9E-B1	ER-9E	B	1-2	07/14/87	1.400 J	508.000	953.000	0.10	100.00	0.00	0.00	100.10	
ER9E-B2	ER-9E	B	2-3	07/14/87	1.000 U	444.000	800.000	6.70	93.20	0.00	0.00	99.90	
ER9E-C0	ER-9E	C	0-1	07/14/87	37.000	973.000	597.000	47.10	52.70	0.00	0.00	99.80	
ER9E-D0	ER-9E	D	0-1	07/14/87	215.000	3373.000	1510.000	24.90	75.10	0.00	0.00	100.00	
ER9E-D1	ER-9E	D	1-2	07/14/87	100.000	1817.000	1470.000	56.50	43.50	0.00	0.00	100.00	
ER9E-D2	ER-9E	D	2-3	07/14/87	228.000	4011.000	970.000	19.10	80.90	0.00	0.00	100.00	
ER9E-E0	ER-9E	E	0-1	07/14/87	344.000	5786.000	13400.000	32.20	67.80	0.00	0.00	100.00	EPTOX
ER9E-E1	ER-9E	E	1-2	07/14/87	126.000	2420.000	4140.000	56.10	43.90	0.00	0.00	100.00	
ER9E-E2	ER-9E	E	2-3	07/14/87	444.000	7384.000	3840.000	36.90	63.30	0.00	0.00	100.20	
ER9F-A0	ER-9F	A	0-1	07/14/87	922.000	30454.000	262000.000	14.30	36.10	14.50	34.30	99.20	
ER9F-A1	ER-9F	A	1-2	07/14/87	35.000	874.000	7960.000	1.10	95.70	1.10	2.00	99.90	
ER9F-A2	ER-9F	A	2-3	07/14/87	16.000	572.000	1280.000	26.10	74.00	0.00	0.00	100.10	
ER9F-B0	ER-9F	B	0-1	07/14/87	10.700	892.000	45000.000	4.90	86.10	5.60	2.90	99.50	EPTOX
ER9F-B1	ER-9F	B	1-2	07/14/87	1.600 J	140.000	2930.000	0.50	99.30	0.00	0.00	99.80	
ER9F-C0	ER-9F	C	0-1	07/14/87	32.000	969.000	15500.000	0.50	95.90	1.10	2.40	99.90	

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

188Q COOMEN

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 8

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER9F-C1	ER-9F	C	1-2	07/14/87	16.900	2080.000	96200.000	2.10	94.00	1.20	2.20	99.50	
ER9F-D0	ER-9F	D	0-1	07/14/87	57.500	1242.000	1070.000	0.20	99.70	0.00	0.00	99.90	
ER9F-D1	ER-9F	D	1-2	07/14/87	50.000	1111.000	901.000	0.00	100.00	0.00	0.00	100.00	
ER9F-E0	ER-9F	E	0-1	07/14/87	53.500	1002.000	1820.000	1.30	98.70	0.00	0.00	100.00	
ER9F-E1	ER-9F	E	1-2	07/14/87	35.200	981.000	1760.000	0.80	99.10	0.00	0.00	99.90	
ER9F-F0	ER-9F	F	0-1	07/14/87	48.600	458.000	3990.000	0.90	99.00	0.00	0.00	99.90	
ER9F-F1	ER-9F	F	1-2	07/14/87	46.000	718.000	3530.000	0.30	99.50	0.00	0.00	99.80	
ER9F-F2	ER-9F	F	2-3	07/14/87	350.000	621.000	2690.000	0.30	99.60	0.00	0.00	99.90	
ER9F-G0	ER-9F	G	0-1	07/14/87	104.000	2606.000	7650.000	2.00	98.00	0.00	0.00	100.00	
ER9F-G1	ER-9F	G	1-2	07/14/87	78.700	605.000	5670.000	4.80	90.70	2.20	2.30	100.00	
ER9F-G2	ER-9F	G	2-3	07/14/87	31.000	725.000	19000.000	3.10	92.30	4.80	1.10	101.30	
ER10-A0	ER-10	A	0-1	07/14/87	552.000	8248.000	69800.000	6.60	74.10	8.60	10.50	99.80	
ER10-A1	ER-10	A	1-2	07/14/87	14.000	896.000	31400.000	5.10	77.00	6.50	11.10	99.70	
ER10-A2	ER-10	A	2-3	07/14/87	16.000	935.000	21400.000	2.30	89.50	3.40	5.20	100.40	
ER10-B0	ER-10	B	0-1	07/14/87	363.000	24500.000	118000.000	32.20	19.00	44.40	15.00	110.60	
ER10-B1	ER-10	B	1-2	07/14/87	108.000	14100.000	162000.000	23.80	26.70	45.20	21.00	116.70	
ER10-B2	ER-10	B	2-3	07/14/87	12.000	2780.000	16200.000	71.80	25.10	1.10	2.00	100.00	
ER10-B2DUP	ER-10	B	2-3	07/14/87	14.000	3070.000	16200.000	62.40	31.80	8.40	17.30	119.90	
ER10A-A0	ER-10	A	0-1	07/14/87	55.000	4081.000	33500.000	1.00	89.10	5.40	4.30	99.80	EPTOX
ER10A-A1	ER-10	A	1-2	07/14/87	156.000	3991.000	32700.000	2.50	89.50	4.70	3.00	99.70	
ER10A-A2	ER-10	A	2-3	07/14/87	24.000	629.000	16200.000	19.80	80.00	0.00	0.00	99.80	
ER10A-B0	ER-10	B	0-1	07/14/87	41.000 U	2391.000	5780.000	3.90	96.00	0.00	0.00	99.90	
ER10A-B1	ER-10	B	1-2	07/14/87	50.000	3161.000	4840.000	6.00	93.90	0.00	0.00	99.90	
ER10A-B2	ER-10	B	2-3	07/14/87	48.000	2765.000	4850.000	22.00	77.90	0.00	0.00	99.90	

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

7880 277171

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 9

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER10A-C0	ER-10	C	0-1	07/14/87	41.000	1079.000	1620.000	45.60	54.20	0.00	0.00	99.80	
ER10A-C1	ER-10	C	1-2	07/14/87	12.300	358.000	374.000	77.90	22.10	0.00	0.00	100.00	
ER10A-D0	ER-10	D	0-1	07/14/87	55.000	1116.000	1030.000	88.30	11.80	0.00	0.00	100.10	
ER10A-E0	ER-10	E	0-1	07/14/87	41.000	1481.000	648.000	67.60	32.40	0.00	0.00	100.00	
ER10A-F0	ER-10	F	0-1	07/14/87	27.000	932.000	1090.000	61.80	38.10	0.00	0.00	99.90	
ER10A-G0	ER-10	G	0-1	07/14/87	231.000	8270.000	11800.000	38.00	61.90	0.00	0.00	99.90	
ER10A-G1	ER-10	G	1-2	07/14/87	76.000	3714.000	2520.000	64.40	35.60	0.00	0.00	100.00	
ER10A-G2	ER-10	G	2-3	07/14/87	25.000	1305.000	2850.000	52.60	47.40	0.00	0.00	100.00	
ER10A-H0	ER-10	H	0-1	07/14/87	40.000	2555.000	8910.000	42.90	57.10	0.00	0.00	100.00	
ER10A-H1	ER-10	H	1-2	07/14/87	12.000	1010.000	1600.000	51.20	48.60	0.00	0.00	99.80	
ER10A-H2	ER-10	H	2-3	07/14/87	27.000	2111.000	2950.000	50.30	49.70	0.00	0.00	100.00	
ER10A-H2DUP	ER-10	H	2-3	07/14/87	0.000	0.000	8490.000	38.70	61.20	0.00	0.00	99.90	
ER10A-I0	ER-10	I	0-1	07/14/87	77.000	4910.000	12300.000	36.60	63.50	0.00	0.00	100.10	INORG VOA BNA PESPCB
ER10A-I1	ER-10	I	1-2	07/14/87	60.000	4201.000	8090.000	30.90	69.00	0.00	0.00	99.90	
ER10A-I2	ER-10	I	2-3	07/14/87	18.000	1360.000	5880.000	43.00	57.00	0.00	0.00	100.00	
ER11-A0	ER-11	A	0-1	07/14/87	15.100	21273.000	5340.000	12.30	83.10	2.70	1.50	99.60	INORG EPTOX VOA BNA PESPCB
ER11-A1	ER-11	A	1-2	07/14/87	4.600	3510.000	4720.000	34.70	64.10	0.80	0.70	100.00	
ER11-A2	ER-11	A	2-3	07/14/87	3.200	2340.000	3500.000	16.10	82.10	1.30	0.40	99.90	
ER11-B0	ER-11	B	0-1	07/14/87	2.200 U	3170.000	13200.000	14.20	84.70	0.74	0.38	100.00	
ER11-B1	ER-11	B	1-2	07/14/87	4.700	5240.000	4060.000	13.80	84.10	1.10	0.90	99.90	
ER11-B2	ER-11	B	2-3	07/14/87	2.100 U	1290.000	3200.000	17.00	82.40	0.40	0.40	100.20	
ER20-S	ER-20	S	0-1	07/14/87	9.900	1660.000 U	6480.000	2.40	93.80	2.91	0.58	99.69	
ER21-S	ER-21	S	0-1	07/14/87	25.000	3650.000	93800.000	3.90	48.70	33.57	7.01	93.18	

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

5880 700NIA

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 10

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER22-S	ER-22	S	0-1	07/14/87	234.000	27500.000	102000.000	14.10	47.90	23.07	9.37	94.44	
ER23-S	ER-23	S	0-1	07/14/87	21.000	20900.000	23000.000	5.60	39.90	44.38	5.60	95.48	
ER26-S	ER-26	S	0-1	07/14/87	35.000	9720.000	20500.000	0.40	83.00	11.90	3.56	98.86	
ER27-S	ER-27	S	0-1	07/14/87	93.000	25200.000	14700.000	3.00	69.50	21.37	5.26	99.13	
ER29-S	ER-29	S	0-1	07/14/87	16.000	3000.000	8410.000	0.80	95.60	2.43	0.95	99.78	
ER32-S	ER-32	S	0-1	07/14/87	59.000	19500.000	21700.000	11.10	41.90	35.47	10.23	98.70	
ER32-SDUP	ER-32	S	0-1	07/14/87	12.000	21800.000	10300.000	1.60	34.50	47.81	13.93	97.84	
ER37-S	ER-37	S	0-1	07/14/87	136.000	31100.000	38200.000	57.00	18.20	15.34	7.76	98.30	
ER38-S	ER-38	S	0-1	07/14/87	41.000	33600.000	45100.000	60.20	16.80	12.63	8.33	97.96	
ER39-S	ER-39	S	0-1	07/14/87	9.200	18100.000	48200.000	20.70	29.60	23.88	23.00	97.18	
ER40-S	ER-40	S	0-1	07/14/87	19.000	20000.000	101000.000	41.60	33.50	11.54	11.98	98.62	
ER43-S	ER-43	S	0-1	07/14/87	11.000	22600.000	18100.000	12.30	35.00	30.18	21.54	99.02	
ER44-S	ER-44	S	0-1	07/14/87	32.000	27600.000	40000.000	24.70	28.80	24.65	19.37	97.52	

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

4880 700MIN

VINELAND CHEMICAL COMPANY SITE
SEDIMENT ANALYSES

DATE: 06/23/88
PAGE 11

SAMPLE ID	STATION	CORE	DEPTH (FT)	DATE SAMPLED	ARSENIC (MG/KG)	IRON (MG/KG)	TOC (MG/KG)	% > SAND	% SAND	% SILT	% CLAY	TOTAL	OTHER ANALYSES PERFORMED
ER45-S	ER-45	S	0-1	07/14/87	27.000	38000.000	33900.000	22.40	44.80	20.25	13.83	101.28	
ER50-S	ER-50	S	0-1	07/14/87	20.000	30100.000	58400.000	5.60	43.80	32.05	15.90	97.35	
ER51-S	ER-51	S	0-1	07/14/87	0.000	0.000	97400.000	26.10	33.10	28.62	10.62	98.44	

EXPLANATION OF CODES:

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- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

5880? 700 NTA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 VOLATILES ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ER0-B0	EROA-A0	EROB-B0	EROC-A0	EROC-A0DUP	ER1-A0	ER4-B0
CASE NUMBER	7729	7729	7537	7729	7729	7537	7729
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-006
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/30/87
-----	-----	-----	-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
BROMOMETHANE	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
VINYL CHLORIDE	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
CHLOROETHANE	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
METHYL CHLORIDE	11.000 X	6.000 X	24.000 X	9.000 X	7.000 X	11.000 U	10.000 U
ACETONE	20.000 X	23.000 X	20.000 U	42.000 X	24.000 X	23.000 X	19.000 X
CARBON DISULFIDE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
1,1-DICHLOROETHENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
1,1-DICHLOROETHANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
TRANS-1,2-DICHLOROETHENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
CHLOROFORM	5.000 U	5.000 X	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
1,2-DICHLOROETHANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
2-BUTANONE	10.000 X	10.000 X	20.000 U	10.000 X	10.000 X	3.000 J	10.000 X
1,1,1-TRICHLOROETHANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
CARBON TETRACHLORIDE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
VINYL ACETATE	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
BROMODICHLOROMETHANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
1,2-DICHLOROPROPANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
TRANS-1,3-DICHLOROPROPENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
TRICHLOROETHENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
DIBROMOCHLOROMETHANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
 B - COMPOUND FOUND IN BLANK
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 A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

9880-000 NIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 VOLATILES ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ER0-B0	EROA-A0	EROB-B0	EROC-A0	EROC-A0DUP	ER1-A0	ER4-B0
CASE NUMBER	7729	7729	7537	7729	7729	7537	7729
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-006
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/30/87
-----	-----	-----	-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
BENZENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
CIS-1,3-DICHLOROPROPENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
2-CHLOROETHYL VINYLETHER	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
BROMOFORM	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
4-METHYL-2-PENTANONE	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
2-HEXANONE	10.000 U	10.000 U	20.000 U	10.000 U	10.000 U	11.000 U	10.000 U
TETRACHLOROETHENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
1,1,2,2-TETRACHLOROETHANE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
TOLUENE	4.000 J	5.000 U	10.000 U	250.000	260.000	6.000 U	130.000
CHLOROBENZENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
ETHYLBENZENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
STYRENE	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
TOTAL XYLEMES	5.000 U	5.000 U	10.000 U	5.000 U	5.000 U	6.000 U	5.000 U
TOTAL TICS	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TIC CONCENTRATION	0.000 A	0.000 X	0.000 A				

EXPLANATION OF CODES:

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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

188.8 700 MIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 VOLATILES ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER6-A0	ER6A-B0	ER7-80	ER9-A0	ER9C-E0	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7729	7729	7537	7573	7537	7573
CLP SAMPLE ID	BL-443	BL-008	BL-007	BL-458	BK-463	BL-455	BK-465
DATE SAMPLED	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87	06/30/87	07/10/87
CHLOROMETHANE	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	17.000 U	20.000 U
BROMOMETHANE	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	17.000 U	20.000 U
VINYL CHLORIDE	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	17.000 U	20.000 U
CHLOROETHANE	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	17.000 U	20.000 U
METHYL CHLORIDE	11.000 X	34.000 B	6.000 X	13.000 U	10.000 X	17.000 U	20.000 U
ACETONE	68.000 X	79.000 X	18.000 X	6.000 X	10.000 X	20.000 X	10.000 X
CARBON DISULFIDE	13.000 U	5.000 U	5.000 U	6.000 U	10.000 X	38.000 X	10.000 X
1,1-DICHLOROETHENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	4.000 J	10.000 U
1,1-DICHLOROETHANE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
TRANS-1,2-DICHLOROETHENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
CHLOROFORM	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
1,2-DICHLOROETHANE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
2-BUTANONE	13.000 J	10.000 X	10.000 X	13.000 U	10.000 X	17.000 U	10.000 U
1,1,1-TRICHLOROETHANE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	20.000 U
CARBON TETRACHLORIDE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
VINYL ACETATE	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	8.000 U	10.000 U
BROMODICHLOROMETHANE	13.000 U	5.000 U	5.000 U	13.000 U	10.000 X	17.000 U	20.000 U
1,2-DICHLOROPROPANE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
TRANS-1,3-DICHLOROPROPENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
TRICHLOROETHENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
DIBROMOCHLOROMETHANE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

8880 - 700 NIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 VOLATILES ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7729	7729	7537	7573	7537	7573
CLP SAMPLE ID	BL-443	BL-008	BL-007	BL-458	BK-463	BL-455	BK-465
DATE SAMPLED	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87	06/30/87	07/10/87
-----	-----	-----	-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
BENZENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
CIS-1,3-DICHLOROPROPENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
2-CHLOROETHYL VINYLETHER	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	17.000 U	20.000 U
BROMOFORM	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
4-METHYL-2-PENTANONE	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	17.000 U	20.000 U
2-HEXANONE	26.000 U	10.000 U	10.000 U	13.000 U	10.000 X	17.000 U	20.000 U
TETRACHLOROETHENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
1,1,2,2-TETRACHLOROETHANE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
TOLUENE	100.000	5.000 U	3.000 J	3.000 X	15.000 J	10.000 X	1.000 X
CHLOROBENZENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
ETHYLBENZENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
STYRENE	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
TOTAL XYLEMES	13.000 U	5.000 U	5.000 U	6.000 U	5.000 X	8.000 U	10.000 U
TOTAL TICS	2.000	0.000	0.000	1.000	0.000	0.000	1.000
TIC CONCENTRATION	381.000 A	0.000 R	0.000 A	217.000 A	0.000 A	0.000 A	13.000 J

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
SEDIMENT SAMPLES
VOLATILES ANALYSES
(UG/KG)

DATE: 05/10/88
PAGE 3

SAMPLE ID ER11-A0
CASE NUMBER 7508
CLP SAMPLE ID BJ-927
DATE SAMPLED 06/23/87

CHLOROMETHANE	13.000	U
BROMOMETHANE	13.000	U
VINYL CHLORIDE	13.000	U
CHLOROETHANE	13.000	U
METHYL CHLORIDE	3.000	J
ACETONE	24.000	X
CARBON DISULFIDE	6.000	U
1,1-DICHLOROETHENE	6.000	U
1,1-DICHLOROETHANE	6.000	U
TRANS-1,2-DICHLOROETHENE	6.000	U
CHLOROFORM	6.000	U
1,2-DICHLOROETHANE	6.000	U
2-BUTANONE	13.000	U
1,1,1-TRICHLOROETHANE	6.000	U
CARBON TETRACHLORIDE	6.000	U
VINYL ACETATE	13.000	U
BROMODICHLOROMETHANE	6.000	U
1,2-DICLOROPROPANE	6.000	U
TRANS-1,3-DICLOROPROPENE	6.000	U
TRICHLOROETHENE	6.000	U
DIBROMOCHLOROMETHANE	6.000	U

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
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VINELAND CHEMICAL COMPANY SITE
SEDIMENT SAMPLES
VOLATILES ANALYSES
(UG/KG)

DATE: 05/10/88
PAGE 3 (CONT.)

SAMPLE ID ER11-A0
CASE NUMBER 7508
CLP SAMPLE ID BJ-927
DATE SAMPLED 06/23/87

1,1,2-TRICHLOROETHANE 6.000 U
BENZENE 6.000 U
CIS-1,3-DICHLOROPROPENE 6.000 U
2-CHLOROETHYL VINYL ETHER 13.000 U
BROMOFORM 6.000 U
4-METHYL-2-PENTANONE 13.000 U
2-HEXANONE 13.000 U
TETRACHLOROETHENE 6.000 U
1,1,2,2-TETRACHLOROETHANE 6.000 U
TOLUENE 6.000 U
CHLOROBENZENE 6.000 U
ETHYL BENZENE 6.000 U
STYRENE 6.000 U
TOTAL XYLEMES 6.000 U

TOTAL TICS 0.000
TIC CONCENTRATION 0.000 A

EXPLANATION OF CODES:

J - ESTIMATED VALUE
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1680 700 NIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ERO-B0	EROA-A0	EROB-B0	EROC-A0	EROC-A0DUP	ER1-A0	ER10A-10
CASE NUMBER	7729	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-467
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/08/87
-----	-----	-----	-----	-----	-----	-----	-----
PHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BIS[2-CHLOROETHYL] ETHER	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2-CHLOROPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
1,3-DICHLOROBENZENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
1,4-DICHLOROBENZENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BENZYL ALCOHOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
1,2-DICHLOROBENZENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2-METHYLPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BIS[2-CHLOROISOPROPYL] ETHER	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
4-METHYLPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
N-NITROSO-DIPIROPYLAMINE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
HEXACHLORETHANE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
NITROBENZENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
ISOPHORONE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2-NITROPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2,4-DIMETHYLPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BENZOIC ACID	1600.000 U	1600.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BIS[2-CHLOROETHOXY] METHANE	330.000 U	330.000 U	670.000 U	96000.000 U	96000.000 U	370.000 U	2100.000 U
2,4-DICHLOROPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2,2,4-TRICHLOROBENZENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
NAPHTHALENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

7680 700 NIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ERO-B0	EROA-A0	EROB-B0	EROC-A0	EROC-A0DUP	ER1-A0	ER10A-10
CASE NUMBER	7729	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-467
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/08/87
-----	-----	-----	-----	-----	-----	-----	-----
4-CHLOROANILINE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
HEXACHLOROBUTADIENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
4-CHLORO-3-METHYLPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2-METNAPHTHALENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
HEXAACL CYCLOPENTADIENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2,4,6-TRICHLOROPHENOL	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2,4,5-TRICHLOROPHENOL	1600.000 U	1600.000 U	3300.000 U	96000.000 U	96000.000 U	1900.000 U	2100.000 U
2-CHLORONAPHTHALENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
2-NITROANILINE	1600.000 U	1600.000 U	3300.000 U	96000.000 U	96000.000 U	1900.000 U	2100.000 U
DIMETHYL PHTHALATE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	2100.000 U
ACENAPHTHYLENE	330.000 U	330.000 U	67.000 J	20000.000 U	20000.000 U	370.000 U	440.000 U
3-NITROANILINE	1600.000 X	1600.000 X	3300.000 U	96000.000 X	96000.000 X	1900.000 U	440.000 U
ACENAPHTHENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	2100.000 U
2,4-DINITROPHENOL	1600.000 U	1600.000 U	3300.000 U	96000.000 U	96000.000 U	370.000 U	450.000
4-NITROPHENOL	1600.000 U	1600.000 U	3300.000 U	96000.000 U	96000.000 U	1900.000 U	2100.000 U
DIBENZOFURAN	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	1900.000 U	2100.000 U
2,4-DINITROTOLUENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	350.000 J
2,6-DINITROTOLUENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
DIETHYLPHTHALATE	330.000 U	330.000 U	67.000 J	20000.000 U	20000.000 U	370.000 U	440.000 U
4-CHLOROPHENYL PHENYL ETHER	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
FLUORENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
						370.000 U	620.000

EXPLANATION OF CODES:

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- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

Fb.80 200 NIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ERO-B0	EROA-A0	EROB-B0	EROC-A0	EROC-AODUP	ER1-A0	ER10A-10
CASE NUMBER	7729	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-467
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/08/87
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4-NITROANILINE	1600.000 U	1600.000 U	3300.000 U	96000.000 U	96000.000 U	50.000 X	2100.000 U
4,6-DINITRO-2-METHYLPHENOL	1600.000 U	1600.000 U	3300.000 U	96000.000 U	96000.000 U	1900.000 U	2100.000 U
N-NITROSODIPHENYLAMINE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
4-BROMOPHENYL PHENYL ETHER	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
HEXACHLOROBENZENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
PENTACHLOROPHENOL	1600.000 U	1600.000 U	3300.000 U	96000.000 U	96000.000 U	1900.000 U	2100.000 U
PHENANTHRENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	150.000 J	2100.000
ANTHRACENE	330.000 U	330.000 U	270.000 J	20000.000 U	20000.000 U	370.000 U	350.000 J
DI-n-BUTYLPHthalate	330.000 X	330.000 X	67.000 J	20000.000 U	20000.000 U	2800.000 B	440.000 U
FLUORANTHRENE	30.000 J	330.000 U	600.000 J	830.000 J	20000.000 U	260.000 J	1100.000
PYRENE	32.000 J	330.000 U	330.000 J	1200.000 J	20000.000 U	300.000 J	890.000
BUTYL BENZYL PHTHALATE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
3,3-DICHLOROBENZIDINE	660.000 U	660.000 U	1300.000 U	40000.000 U	40000.000 U	740.000 U	870.000 U
BENZO[a]ANTHRACENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	110.000 J	200.000 J
BIS[2-ETHYLHEXYL]PHTHALATE	330.000 X	330.000 X	670.000 U	20000.000 U	20000.000 U	10.000 X	440.000 U
CHRYSENE	330.000 U	330.000 U	670.000	20000.000 U	20000.000 U	190.000 J	230.000 J
DI-n-OCTYL PHTHALATE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BENZO[b]FLUORANTHENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000	440.000 U
BENZO[k]FLUORANTHENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BENZO[a]PYRENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	150.000 J	440.000 U
INDENO[1,2,3-CD]PYRENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U

EXPLANATION OF CODES:

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- R - NOT REQUIRED FOR ANALYSIS
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- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

4680 700 NIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ERO-B0	EROA-A0	EROB-B0	EROC-A0	EROC-A0DUP	ER1-A0	ER10A-10
CASE NUMBER	7729	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-467
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/08/87
-----	-----	-----	-----	-----	-----	-----	-----
DIBENZO[A,H]ANTHRACENE	530.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
BENZO[G,H,I]PERYLENE	330.000 U	330.000 U	670.000 U	20000.000 U	20000.000 U	370.000 U	440.000 U
TOTAL TICS	11.000	18.000	6.000	13.000	10.000	13.000	13.000
TIC CONCENTRATION	3462.000	123496.000	69508.000 A	50066.000	42124.000	184642.000 A	49800.000 JAB

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

8680 800 NIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER11-A0	ER4-B0	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0
CASE NUMBER	7508	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BJ-927	BL-006	BL-443	BL-008	BL-007	BL-458	BK-463
DATE SAMPLED	06/23/87	07/30/87	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87
-----	-----	-----	-----	-----	-----	-----	-----
PHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
BIS[2-CHLOROETHYL] ETHER	871.000 U	860.000 J	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2-CHLOROPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
1,3-DICHLOROBENZENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
1,4-DICHLOROBENZENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
BENZYL ALCOHOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
1,2-DICHLOROBENZENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2-METHYLPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
BIS[2-CHLOROISOPROPYL] ETHER	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
4-METHYLPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
N-NITROSO-DIPROPYLAMINE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
HEXACHLORETHANE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
NITROBENZENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
ISOPHORONE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2-NITROPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2,4-DIMETHYLPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
BENZOIC ACID	4224.000 U	96000.000 U	880.000 U	1600.000 X	1600.000 U	420.000 U	310.000 J
BIS[2-CHLOROETHOXY] METHANE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2,4-DICHLOROPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2,2,4-TRICHLOROBENZENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
NAPHTHALENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
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9680 700 NIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER11-A0	ER4-B0	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0
CASE NUMBER	7508	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BJ-927	BL-006	BL-443	BL-008	BL-007	BL-458	BK-463
DATE SAMPLED	06/23/87	07/30/87	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87
-----	-----	-----	-----	-----	-----	-----	-----
4-CHLOROANILINE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
HEXACHLOROBUTADIENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
4-CHLORO-3-METHYLPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2-METNAPHTHALENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
HEXAACLYCLOPENTADIENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2,4,6-TRICHLOROPHENOL	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2,4,5-TRICHLOROPHENOL	4224.000 U	96000.000 U	4400.000 U	1600.000 X	1600.000 U	2100.000 U	4700.000 U
2-CHLORONAPHTHALENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2-NITROANILINE	4224.000 U	96000.000 U	4400.000 U	1600.000 X	1600.000 U	2100.000 U	4700.000 U
DIMETHYL PHTHALATE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
ACENAPHTHYLENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
3-NITROANILINE	4224.000 U	96000.000 X	4400.000 U	1600.000 X	1600.000 X	83.000 J	980.000 U
ACENAPHTHENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	2100.000 U	4700.000 U
2,4-DINITROPHENOL	4224.000 U	96000.000 U	4400.000 U	1600.000 X	1600.000 U	420.000 U	980.000 U
4-NITROPHENOL	4224.000 U	96000.000 U	4400.000 U	1600.000 X	1600.000 U	2100.000 U	4700.000 U
DIBENZOFURAN	871.000 U	20000.000 U	880.000 U	1600.000 X	1600.000 U	2100.000 U	4700.000 U
2,4-DINITROTOLUENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
2,6-DINITROTOLUENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
DIETHYLPHTHALATE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
4-CHLOROPHENYL PHENYL ETHER	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	42.000 J	980.000 U
FLUORENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
					330.000 U	420.000 U	980.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

689 700NIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER11-A0	ER4-B0	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0
CASE NUMBER	7508	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BJ-927	BL-006	BL-443	BL-008	BL-007	BL-458	BK-463
DATE SAMPLED	06/23/87	07/30/87	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87
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4-NITROANILINE	4224.000 U	96000.000 U	1600.000 X	1600.000 X	1600.000 U	1600.000 X	4700.000 U
4,6-DINITRO-2-METHYLPHENOL	4224.000 U	96000.000 U	4400.000 U	1600.000 X	1600.000 U	2100.000 U	4700.000 U
N-NITROSODIPHENYLAMINE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
4-BROMOPHENYL PHENYL ETHER	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
HEXACHLOROBENZENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
PENTACHLOROPHENOL	4224.000 U	96000.000 U	4400.000 U	1600.000 X	1600.000 U	2100.000 U	4700.000 U
PHENANTHRENE	180.000 J	20000.000 U	880.000 U	330.000 X	330.000 U	250.000 J	980.000 U
ANTHRACENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	170.000 J	980.000 U
DI-n-BUTYLPHthalATE	330.000 X	20000.000 U	8900.000 B	330.000 X	330.000 U	420.000 U	980.000 U
FLUORANTHRENE	170.000 J	20000.000 U	880.000 U	330.000 X	330.000 U	42.000 J	980.000 U
PYRENE	240.000 J	20000.000 U	880.000 U	330.000 X	330.000 U	290.000 J	980.000 U
BUTYL BENZYL PHTHALATE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	380.000 J	980.000 U
3,3-DICHLOROBENZIDINE	1742.000 U	40000.000 U	1800.000 U	660.000 X	660.000 U	830.000 U	980.000 U
BENZO[a]ANTHRACENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	170.000 J	980.000 U
BIS[2-ETHYLHEXYL]PHTHALATE	871.000 U	20000.000 U	2900.000 B	330.000 X	330.000 U	420.000 U	980.000 U
CHRYSENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 X	420.000 U	980.000 U
DI-n-OCTYL PHTHALATE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	250.000 J	980.000 U
BENZO[b]FLUORANTHENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
BENZO[k]FLUORANTHENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	210.000 J	980.000 U
BENZO[a]PYRENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
INDENO[1,2,3-CD]PYRENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	170.000 J	980.000 U
						83.000 J	980.000 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER11-A0	ER4-B0	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0
CASE NUMBER	7508	7729	7537	7729	7729	7537	7573
CLP SAMPLE ID	BJ-927	BL-006	BL-443	BL-008	BL-007	BL-458	BK-463
DATE SAMPLED	06/23/87	07/30/87	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87
	-----	-----	-----	-----	-----	-----	-----
DIBENZO[A,H]ANTHRACENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	420.000 U	980.000 U
BENZO[G,H,I]PERYLENE	871.000 U	20000.000 U	880.000 U	330.000 X	330.000 U	83.000 J	980.000 U
TOTAL TICS	11.000	4.000	9.000	0.000	17.000	6.000	9.000
TIC CONCENTRATION	7800.000 A	54600.000	275307.000 A	0.000 X	66190.000	87291.000 A	23490.000 J

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 3

SAMPLE ID	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7573
CLP SAMPLE ID	BL-455	BK-465
DATE SAMPLED	06/30/87	07/10/87
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PHENOL	560.000	U	650.000	U
BIS[2-CHLOROETHYL] ETHER	560.000	U	650.000	U
2-CHLOROPHENOL	560.000	U	650.000	U
1,3-DICHLOROBENZENE	560.000	U	650.000	U
1,4-DICHLOROBENZENE	560.000	U	650.000	U
BENZYL ALCOHOL	560.000	U	650.000	U
1,2-DICHLOROBENZENE	560.000	U	650.000	U
2-METHYLPHENOL	560.000	U	650.000	U
BIS[2-CHLOROISOPROPYL] ETHER	560.000	U	650.000	U
4-METHYLPHENOL	560.000	U	650.000	U
N-NITROSO-DIPROPYLAMINE	560.000	U	650.000	U
HEXACHLORETHANE	560.000	U	650.000	U
NITROBENZENE	560.000	U	650.000	U
ISOPHORONE	560.000	U	650.000	U
2-NITROPHENOL	560.000	U	650.000	U
2,4-DIMETHYLPHENOL	560.000	U	650.000	U
BENZOIC ACID	560.000	U	3100.000	U
BIS[2-CHLOROETHOXY] METHANE	560.000	U	650.000	U
2,4-DICHLOROPHENOL	560.000	U	650.000	U
2,2,4-TRICHLOROBENZENE	560.000	U	650.000	U
NAPHTHALENE	560.000	U	650.000	U

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
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- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 3 (CONT.)

SAMPLE ID	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7573
CLP SAMPLE ID	BL-455	BK-465
DATE SAMPLED	06/30/87	07/10/87
	-----	-----

4-CHLOROANILINE	560.000	U	650.000	U
HEXACHLOROBUTADIENE	560.000	U	650.000	U
4-CHLORO-3-METHYLPHENOL	560.000	U	650.000	U
2-METNAPHTHALENE	560.000	U	650.000	U
HEXAACLCPENTADIENE	560.000	U	650.000	U
2,4,6-TRICHLOROPHENOL	560.000	U	650.000	U
2,4,5-TRICHLOROPHENOL	2800.000	U	3100.000	U
2-CHLORONAPHTHALENE	560.000	U	650.000	U
2-NITROANILINE	2800.000	U	3100.000	U
DIMETHYL PHTHALATE	560.000	U	650.000	U
ACENAPHTHYLENE	560.000	U	650.000	U
3-NITROANILINE	2800.000	U	3100.000	U
ACENAPHTHENE	560.000	U	650.000	U
2,4-DINITROPHENOL	2800.000	U	3100.000	U
4-NITROPHENOL	2800.000	U	3100.000	U
DIBENZOFURAN	560.000	U	650.000	U
2,4-DINITROTOLUENE	560.000	U	650.000	U
2,6-DINITROTOLUENE	560.000	U	650.000	U
DIETHYLPHTHALATE	560.000	U	650.000	U
4-CHLOROPHENYL PHENYL ETHER	560.000	U	650.000	U
FLUORENE	560.000	U	650.000	U

EXPLANATION OF CODES:

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 A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 BNA ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 3 (CONT.)

SAMPLE ID	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7573
CLP SAMPLE ID	BL-455	BK-465
DATE SAMPLED	06/30/87	07/10/87
	-----	-----

4-NITROANILINE	2800.000	U	3100.000	U
4,6-DINITRO-2-METHYLPHENOL	2800.000	U	3100.000	U
N-NITROSODIPHENYLAMINE	560.000	U	650.000	U
4-BROMOPHENYL PHENYL ETHER	560.000	U	650.000	U
HEXACHLOROBENZENE	560.000	U	650.000	U
PENTACHLOROPHENOL	2800.000	U	3100.000	U
PHENANTHRENE	560.000	U	650.000	U
ANTHRACENE	170.000	J	650.000	U
DI-n-BUTYLPHthalate	560.000	U	650.000	U
FLUORANTHRENE	560.000	U	650.000	U
PYRENE	560.000	U	650.000	U
BUTYL BENZYL PHTHALATE	560.000	U	650.000	U
3,3-DICHLOROBENZIDINE	1100.000	U	1300.000	U
BENZO[a]ANTHRACENE	560.000	U	650.000	U
BIS[2-ETHYLHEXYL]PHTHALATE	560.000	U	650.000	U
CHRYSENE	560.000	U	650.000	U
DI-n-OCTYL PHTHALATE	560.000	U	650.000	U
BENZO[b]FLUORANTHENE	560.000	U	650.000	U
BENZO[k]FLUORANTHENE	560.000	U	650.000	U
BENZO[a]PYRENE	560.000	U	650.000	U
INDENO[1,2,3-CD]PYRENE	560.000	U	650.000	U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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 - DETECTED AT CONCENTRATION SHOWN
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 R - NOT REQUIRED FOR ANALYSIS
 X - REJECTED VALUE
 A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
SEDIMENT SAMPLES
BNA ANALYSES
(UG/KG)

DATE: 05/10/88
PAGE 3 (CONT.)

SAMPLE ID	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7573
CLP SAMPLE ID	BL-455	BK-465
DATE SAMPLED	06/30/87	07/10/87

DIBENZO[A,H]ANTHRACENE	560.000 U	650.000 U
BENZO[G,H,I]PERYLENE	560.000 U	650.000 U
TOTAL TICS	8.000	13.000
TIC CONCENTRATION	120186.000 A	18420.000 J

EXPLANATION OF CODES:

J - ESTIMATED VALUE
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R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ERO-B0	EROA-A0	EROB-B0	EROC-A0	EROC-AODUP	ER1-A0	ER4-B0
CASE NUMBER	7729	7729	7537	7729	7729	7537	7729
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-006
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/30/87
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ALPHA-BHC	9.500 U	9.800 U	67.000 U	55.000 U	60.000 U	3.700 U	12.000 U
BETA-BHC	9.500 U	9.800 U	67.000 U	55.000 U	60.000 U	3.700 U	12.000 U
DELTA-BHC	9.500 U	9.800 U	67.000 U	55.000 U	60.000 U	3.700 U	12.000 U
GAMMA-BHC	9.500 U	9.800 U	230.000	55.000 U	60.000 U	3.700 U	12.000 U
HEPTACHLOR	9.500 U	9.800 U	67.000 U	55.000 U	60.000 U	3.700 U	12.000 U
ALDRIN	9.500 U	9.800 U	67.000 U	55.000 U	60.000 U	3.700 U	12.000 U
HEPTACHLOR EPOXIDE	9.500 U	9.800 U	67.000 U	55.000 U	60.000 U	3.700 U	12.000 U
ENDOSULFAN I	9.500 U	9.800 U	67.000 U	55.000 U	60.000 U	3.700 U	12.000 U
DIELDRIN	19.000 U	20.000 U	130.000 U	110.000 U	120.000 U	7.400 U	25.000 U
4-4-DDE	19.000 U	20.000 U	130.000 U	16.000 X	16.000 X	7.400 U	25.000 X
ENDRIN	19.000 U	20.000 U	130.000 U	110.000 U	120.000 U	7.400 U	25.000 U
ENDOSULFAN II	19.000 U	20.000 U	130.000 U	110.000 U	120.000 U	7.400 U	25.000 U
4-4-DDD	19.000 U	20.000 U	130.000 U	16.000 X	16.000 X	7.400 U	25.000 U
ENDOSULFAN SULFATE	19.000 U	20.000 U	130.000 U	16.000 X	120.000 U	7.400 U	25.000 X
4-4-DDT	19.000 U	20.000 U	130.000 U	110.000 U	120.000 U	7.400 U	25.000 U
METHOXYCHLOR	95.000 U	98.000 U	670.000 U	550.000 U	600.000 U	37.000 U	25.000 X
ENDRIN KETONE	19.000 U	20.000 U	130.000 U	110.000 U	120.000 U	7.400 U	120.000 U
CHLORDANE	95.000 U	98.000 U	670.000 U	550.000 U	600.000 U	37.000 U	25.000 U
TOXAPHENE	190.000 U	200.000 U	670.000 U	1100.000 U	1200.000 U	37.000 U	120.000 U
AROCHLOR 1016	95.000 U	98.000 U	670.000 U	550.000 U	600.000 U	37.000 U	250.000 U
AROCHLOR 1221	95.000 U	98.000 U	670.000 U	550.000 U	600.000 U	37.000 U	120.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ERO-B0	EROA-A0	EROB-B0	EROC-A0	EROC-A0DUP	ER1-A0	ER4-B0
CASE NUMBER	7729	7729	7537	7729	7729	7537	7729
CLP SAMPLE ID	BL-005	BL-025	BL-453	BL-026	BL-027	BL-446	BL-006
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/30/87
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AROCHLOR 1232	95.000 U	98.000 U	670.000 U	550.000 U	600.000 U	37.000 U	120.000 U
AROCHLOR 1242	95.000 U	98.000 U	670.000 U	550.000 U	600.000 U	37.000 U	120.000 U
AROCHLOR 1248	95.000 U	98.000 U	670.000 U	550.000 U	600.000 U	37.000 U	120.000 U
AROCHLOR 1254	190.000 U	200.000 U	1300.000 U	1100.000 U	1200.000 U	37.000 U	120.000 U
AROCHLOR 1260	190.000 U	200.000 U	1300.000 U	1100.000 U	1200.000 U	74.000 U	250.000 U
-----	-----	-----	-----	-----	-----	74.000 U	250.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- D - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7729	7729	7537	7537	7537	7573
CLP SAMPLE ID	BL-443	BL-008	BL-007	BL-458	BK-463	BL-455	BK-465
DATE SAMPLED	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87	06/30/87	07/10/87
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ALPHA-BHC	8.800 U	71.000 U	9.200 U	4.200 U	473.100 U	5.600 U	313.200 U
BETA-BHC	8.800 U	71.000 U	9.200 U	4.200 U	473.100 U	5.600 U	313.200 U
DELTA-BHC	8.800 U	71.000 U	9.200 U	4.200 U	473.100 U	5.600 U	313.200 U
GAMMA-BHC	8.800 U	71.000 U	9.200 U	4.200 U	473.100 U	5.600 U	313.200 U
HEPTACHLOR	8.800 U	71.000 U	9.200 U	8.000 X	473.100 U	5.600 U	313.200 U
ALDRIN	8.800 U	71.000 U	9.200 U	4.200 U	473.100 U	5.600 U	313.200 U
HEPTACHLOR EPOXIDE	8.800 U	71.000 U	9.200 U	4.200 U	473.100 U	5.600 U	313.200 U
ENDOSULFAN I	8.800 U	71.000 U	9.200 U	4.200 U	473.100 U	5.600 U	313.200 U
DIELDRIN	18.000 U	140.000 U	18.000 U	8.300 U	946.300 U	11.000 U	626.400 U
4-4-DDE	18.000 U	140.000 U	18.000 U	8.300 U	946.300 U	11.000 U	626.400 U
ENDRIN	18.000 U	140.000 U	18.000 U	8.300 U	946.300 U	11.000 U	626.400 U
ENDOSULFAN II	18.000 U	140.000 U	18.000 U	8.300 U	946.300 U	11.000 U	626.400 U
4-4-DDD	18.000 U	140.000 U	18.000 U	18.000	45.000 J	11.000 U	626.400 U
ENDOSULFAN SULFATE	18.000 U	140.000 U	18.000 U	8.300 U	946.300 U	11.000 U	626.400 U
4-4-DDT	18.000 U	140.000 U	18.000 U	32.000	946.300 U	11.000 U	626.400 U
METHOXYCHLOR	88.000 U	710.000 U	92.000 U	42.000 U	4731.400 U	56.000 U	3131.900 U
ENDRIN KETONE	18.000 U	140.000 U	18.000 U	8.300 U	946.300 U	11.000 U	626.400 U
CHLORDANE	88.000 U	710.000 U	92.000 U	42.000 U	4731.400 U	56.000 U	3131.900 U
TOXAPHENE	88.000 U	1400.000 U	180.000 U	42.000 U	9462.700 U	56.000 U	6263.900 U
AROCHLOR 1016	88.000 U	710.000 U	92.000 U	42.000 U	4731.400 U	56.000 U	3131.900 U
AROCHLOR 1221	88.000 U	710.000 U	92.000 U	42.000 U	4731.400 U	56.000 U	3131.900 U

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

9060 700 NIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER6-A0	ER6A-B0	ER7-80	ER9-A0	ER9C-E0	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7729	7729	7537	7537	7537	7573
CLP SAMPLE ID	BL-443	BL-008	BL-007	BL-458	BK-463	BL-455	7573
DATE SAMPLED	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87	06/30/87	BK-465
	-----	-----	-----	-----	-----	-----	07/10/87
AROCHLOR 1232	88.000 U	710.000 U	92.000 U	42.000 U	4731.400 U	56.000 U	3131.900 U
AROCHLOR 1242	88.000 U	710.000 U	92.000 U	42.000 U	4731.400 U	56.000 U	3131.900 U
AROCHLOR 1248	88.000 U	710.000 U	92.000 U	42.000 U	4731.400 U	56.000 U	3131.900 U
AROCHLOR 1254	180.000 U	1400.000 U	180.000 U	83.000 U	9462.700 U	110.000 U	3131.900 U
AROCHLOR 1260	180.000 U	1400.000 U	180.000 U	83.000 U	9462.700 U	110.000 U	6263.900 U
	-----	-----	-----	-----	-----	-----	6263.900 U

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
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- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

2060 TOONIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 3

SAMPLE ID	ER10A-10	ER11-A0
CASE NUMBER	7573	7508
CLP SAMPLE ID	BL-467	BJ-927
DATE SAMPLED	07/08/87	06/23/87

ALPHA-BHC	8.000	X	21.120	U
BETA-BHC	8.000	X	21.120	U
DELTA-BHC	8.000	X	21.120	U
GAMMA-BHC	8.000	X	21.120	U
HEPTACHLOR	8.000	X	21.120	U
ALDRIN	8.000	X	21.120	U
HEPTACHLOR EPOXIDE	8.000	X	21.120	U
ENDOSULFAN I	8.000	X	21.120	U
DIELDRIN	16.000	X	42.240	U
4-4-DDE	16.000	X	42.240	U
ENDRIN	16.000	X	42.240	U
ENDOSULFAN II	16.000	X	42.240	U
4-4-DDD	13.000	J	42.240	U
ENDOSULFAN SULFATE	23.000	J	42.240	U
4-4-DDT	16.000	X	42.240	U
METHOXYCHLOR	80.000	X	211.200	U
ENDRIN KETONE	160.000	X	42.240	U
CHLORDANE	80.000	X	211.200	U
TOXAPHENE	160.000	X	422.400	U
AROCHLOR 1016	80.000	X	211.200	U
AROCHLOR 1221	80.000	X	211.200	U

EXPLANATION OF CODES:

-
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- R - NOT REQUIRED FOR ANALYSIS
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 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

8000 TOONI

VINELAND CHEMICAL COMPANY SITE
SEDIMENT SAMPLES
PESTICIDE/PCB ANALYSES
(UG/KG)

DATE: 05/10/88
PAGE 3 (CONT.)

SAMPLE ID	ER10A-10	ER11-A0
CASE NUMBER	7573	7508
CLP SAMPLE ID	BL-467	BJ-927
DATE SAMPLED	07/08/87	06/23/87

AROCHLOR 1232	80.000	X	211.200	U
AROCHLOR 1242	80.000	X	211.200	U
AROCHLOR 1248	80.000	X	211.200	U
AROCHLOR 1254	160.000	X	422.400	U
AROCHLOR 1260	160.000	X	422.400	U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

b050-200MIN

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 INORGANIC ANALYSES
 (MG/KG)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	ER0-B0	EROA-A0	EROB-B0	EROC-A0	EROC-AODUP	ER1-A0	ER4-B0
CASE NUMBER	7729	7729	7537	7729	7729	7537	7729
CLP SAMPLE ID	MBJ-796	MBJ-795	MBI-543	MBJ-791	MBJ-792	MBI-538	MBJ-797
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/30/87
ALUMINUM	1690.000	262.000	25965.000	3110.000	3780.000	4210.000	1020.000
ANTIMONY	8.360 U	8.300 U	10.600 U	11.400 U	11.900 U	12.200 U	10.700 U
ARSENIC	1.520 U	1.510 U	10.000 X	3.910	4.600	7.840	37.300
BARIUM	10.100 U	10.100 U	97.400	82.400	116.000	47.700 J	15.900 J
BERYLLIUM	1.000 U	1.000 U	1.600 J	1.380 U	1.440 U	1.480 U	1.300 U
CADMIUM	1.420	1.210 J	3.900	2.100	2.100	1.840	1.300 U
CALCIUM	188.000 U	186.000 U	2030.000	1890.000	2340.000	903.000 J	351.000 J
CHROMIUM	10.000 X	10.000 X	31.900	10.000 X	10.000 X	8.710	10.000 X
COBALT	1.770 U	1.760 U	6.800 J	2.420 U	3.310 J	3.100 J	2.270 U
COPPER	4.310 U	72.700 U	29.000	90.300	119.000	23.600	9.160
IRON	3090.000	134.000	18800.000	4180.000	5820.000	6330.000	1200.000
LEAD	6.100	5.000 X	314.000	223.000	337.000	153.000	23.300
CYANIDE	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R
MAGNESIUM	87.200 U	86.500 U	1440.000 J	784.000 J	695.000 J	454.000 J	112.000 U
MANGANESE	15.000 X	15.000 X	62.300	15.000 X	15.000 X	27.700	15.000 X
MERCURY	0.130 U	0.120 U	0.160	0.170 U	0.180 U	0.180 U	0.160 U
NICKEL	1.520 U	1.510 U	17.000	14.600	10.400 J	2.990 J	2.790 J
POTASSIUM	127.000 U	126.000 U	380.000	173.000 U	180.000 U	184.000 U	162.000 U
SELENIUM	0.510 U	0.500 U	6.430 U	0.690 U	0.720 U	0.740 U	0.650 U
SILVER	1.770 U	1.760 U	2.200 U	2.420 U	2.520 U	2.580 U	2.270 U
SODIUM	265.000 U	263.000 U	337.000 J	362.000 U	376.000 U	386.000 U	339.000 U

EXPLANATION OF CODES:

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A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

0160700 NDA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 INORGANIC ANALYSES
 (MG/KG)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ERO-B0	EROA-A0	EROB-B0	EROC-A0	EROC-A0DUP	ER1-A0	ER4-B0
CASE NUMBER	7729	7729	7537	7729	7729	7537	7729
CLP SAMPLE ID	MBJ-796	MBJ-795	MBI-543	MBJ-791	MBJ-792	MBI-538	MBJ-797
DATE SAMPLED	07/30/87	07/30/87	06/30/87	07/29/87	07/29/87	06/27/87	07/30/87
-----	-----	-----	-----	-----	-----	-----	-----
THALLIUM	2.030 U	2.010 U	2.570 U	2.770 U	2.880 U	295.000 U	2.600 U
VANADIUM	4.080 J	3.020 U	49.900	4.740 J	8.740 J	10.600 J	3.900 U
ZINC	7.550	5.740	162.000	97.500	142.000	79.300	15.900
SOLIDS (%)	78.900	79.500	62.200	57.800	55.600	54.200	61.600

EXPLANATION OF CODES:

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- A - TICS ANALYZED FOR BUT NOT FOUND
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1160 700 NIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 INORGANIC ANALYSES
 (MG/KG)

DATE: 05/10/88
 PAGE 2

SAMPLE ID	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7729	7729	7537	7537	7537	7573
CLP SAMPLE ID	MBI-535	MBJ-799	MBJ-798	MBJ-664	MBJ-695	MBI-545	MBJ-697
DATE SAMPLED	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87	06/30/87	07/10/87
ALUMINUM	890.000	5960.000	877.000	1500.000	4470.000	1620.000	3450.000
ANTIMONY	16.500 U	61.100 U	7.500 U	8.000 U	9.700 U	10.000 U	8.400 U
ARSENIC	3.000 U	11.100 U	1.360 U	10.000 X	162.000	10.000 X	63.000
BARIUM	20.000 U	318.000 J	9.090 U	9.800 J	28.000 J	16.500 J	48.000 J
BERYLLIUM	2.000 U	7.410 U	0.910 U	1.000 U	1.800 U	1.200 U	1.600 U
CADMIUM	2.000 U	7.410 U	0.910 U	1.000 U	1.800 U	1.200 U	1.500 U
CALCIUM	596.000 J	5480.000 J	168.000 U	428.000 J	759.000 J	385.000 J	774.000 J
CHROMIUM	9.750	10.000 X	10.000 X	13.000	17.000	4.200	9.000
COBALT	3.500 U	13.000 U	1.590 U	1.700 U	4.800 U	2.100 U	4.400 J
COPPER	8.500 U	31.500 U	3.860 U	4.100 U	11.000 J	5.100 U	32.000
IRON	435.000	2100.000	513.000	2360.000	8830.000	2840.000	5360.000
LEAD	21.900	33.800	1.950	16.300	30.000	10.400	33.000
CYANIDE	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R	10.000 R
MAGNESIUM	172.000 U	1240.000 J	78.200 U	83.000 U	150.000 J	104.000 U	256.000 J
MANGANESE	7.200 J	15.000 X	15.000 X	8.000	41.000	10.100	102.000
MERCURY	0.250 U	0.920 U	0.110 U	0.120 U	0.550	0.150 U	1.100
NICKEL	3.000 U	11.100 U	1.450 J	1.400 U	16.000 U	1.800 U	14.000 U
POTASSIUM	250.000 U	926.000 U	114.000 U	121.000 U	161.000 U	152.000 U	139.000 U
SELENIUM	1.000 U	3.700 U	0.450 U	0.480 U	0.200 U	0.610 U	0.190 U
SILVER	4.400 J	13.000 U	1.590 U	1.700 U	2.400 U	2.100 U	2.100 U
SODIUM	522.000 U	1940.000 U	237.000 U	253.000 U	846.000 J	317.000 U	665.000 J

EXPLANATION OF CODES:

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R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

7160-700-NIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 INORGANIC ANALYSES
 (MG/KG)

DATE: 05/10/88
 PAGE 2 (CONT.)

SAMPLE ID	ER6-A0	ER6A-B0	ER7-B0	ER9-A0	ER9C-E0	ER9D-A0	ER9E-A0
CASE NUMBER	7537	7729	7729	7537	7573	7537	7573
CLP SAMPLE ID	MBI-535	MBJ-799	MBJ-798	MBJ-664	MBJ-695	MBI-545	MBJ-697
DATE SAMPLED	06/29/87	07/30/87	07/30/87	07/01/87	07/09/87	06/30/87	07/10/87
THALLIUM	4.000 U	14.800 U	1.820 U	1.940 U	0.240 U	2.430 U	0.230 U
VANADIUM	6.000 U	22.200 U	2.730 U	4.100 J	32.000	3.600 U	9.000 J
ZINC	50.000	94.100	4.090 J	20.400	18.000	12.800	25.000
SOLIDS (%)	40.000	10.800	88.000	82.600	32.800	65.900	37.700

EXPLANATION OF CODES:

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- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
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- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 INORGANIC ANALYSES
 (MG/KG)

DATE: 05/10/88
 PAGE 3

SAMPLE ID	ER10A-10	ER11-A0
CASE NUMBER	7573	7508
CLP SAMPLE ID	MBJ-672	MBJ-458
DATE SAMPLED	07/08/87	06/23/87
	-----	-----

ALUMINUM	932.000	1561.000
ANTIMONY	4.600 U	9.100 U
ARSENIC	77.000	15.100
BARIUM	21.000 J	30.300 J
BERYLLIUM	0.850 U	0.600 U
CADMIUM	0.830 U	1.500
CALCIUM	433.000 J	454.500 U
CHROMIUM	5.200	13.900
COBALT	2.200 U	7.600 U
COPPER	6.000	8.500
IRON	4910.000	21273.000
LEAD	14.000	5.000 X
CYANIDE	10.000 R	10.000 R
MAGNESIUM	64.000 J	151.500 U
MANGANESE	11.000	29.700
MERCURY	0.320	0.200 U
NICKEL	7.500 U	9.100 U
POTASSIUM	76.000 U	303.000 U
SELENIUM	0.150 U	1.500 U
SILVER	1.100 U	3.000 U
SODIUM	363.000 J	454.500 U

EXPLANATION OF CODES:

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 R - NOT REQUIRED FOR ANALYSIS
 X - REJECTED VALUE
 - TICS ANALYZED FOR BUT NOT FOUND

4160 200 VIA
 (UNIDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
SEDIMENT SAMPLES
INORGANIC ANALYSES
(MG/KG)

DATE: 05/10/88
PAGE 3 (CONT.)

SAMPLE ID	ER10A-10	ER11-A0
CASE NUMBER	7573	7508
CLP SAMPLE ID	MBJ-672	MBJ-458
DATE SAMPLED	07/08/87	06/23/87
-----	-----	-----
THALLIUM	0.180 U	1.500 U
VANADIUM	7.900 J	9.100 U
ZINC	20.000	31.200
SOLIDS (%)	59.000	66.000

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VIN 002 0915

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 EP TOXICITY ANALYSES

DATE: 05/10/88
 PAGE 1

(UG/L)

SAMPLE ID	ER0-A0	ER0B-A0	ER0C-B0	ER3-A0	ER3A-A0	ER4-C0	ER6-B0
CASE NUMBER	3097B	3037B	3097B	3097B	7729	3097B	3037B
CLP SAMPLE ID	3097B-988	3037B-430	3097B-1082	3097B-200	3097B-1086	3097B-994	3037B-344
DATE SAMPLED	07/14/87	06/30/87	07/29/87	07/13/87	07/29/87	07/13/87	06/29/87
-----	-----	-----	-----	-----	-----	-----	-----
ALUMINUM	200.000 R	0.000 U	200.000 R	200.000 R	200.000 R	200.000 R	0.000 U
ANTIMONY	60.000 R	0.000 J	60.000 R	60.000 R	60.000 R	60.000 R	0.000 U
ARSENIC	10.000 U	80.000 U	10.000 U	110.000	240.000	150.000	80.000 U
BARIUM	59.000 J	810.000	167.000 J	127.000 J	54.000 J	84.000 J	72.000 J
BERYLLIUM	5.000 R	0.000 U	5.000 R	5.000 R	5.000 R	5.000 R	0.000 U
CADMIUM	4.000 U	12.000	4.000 U	4.000 U	4.000 U	4.000 U	7.000
CALCIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	5000.000 R	0.000 U
CHROMIUM	4.000 U	7.800	4.000 U	4.000 U	4.000 U	4.000 U	7.800 U
COBALT	50.000 R	0.000 U	50.000 R	50.000 R	50.000 R	50.000 R	0.000 U
COPPER	25.000 R	0.000 U	25.000 R	25.000 R	25.000 R	25.000 R	0.000 U
IRON	100.000 R	0.000 U	100.000 R	100.000 R	100.000 R	100.000 R	0.000 U
LEAD	5.000 U	300.000	6.700	5.000 U	25.000	5.000 U	64.000 U
CYANIDE	10.000 R	0.000 U	10.000 R	10.000 R	10.000 U	10.000 R	0.000 U
MAGNESIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	5000.000 R	0.000 U
MANGANESE	15.000 R	0.000 U	15.000 R	15.000 R	15.000 R	15.000 R	0.000 U
MERCURY	0.200 U	2.100	0.200 U	0.200 U	2.700	0.200 U	2.000 U
NICKEL	40.000 R	0.000 U	40.000 R	40.000 R	40.000 R	40.000 R	0.000 U
POTASSIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	5000.000 R	0.000 U
SELENIUM	5.000 U	80.000 U	5.000 U	5.000 U	5.000 U	5.000 U	80.000 U
SILVER	4.000 U	9.000 U	10.000 U	4.000 U	4.000 U	4.000 U	9.000 U
SODIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	5000.000 R	0.000 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

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VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 EP TOXICITY ANALYSES
 (UG/L)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	ER0-A0	ER0B-A0	ER0C-B0	ER3-A0	ER3A-A0	ER4-C0	ER6-B0
CASE NUMBER	3097B	3037B	3097B	3097B	7729	3097B	3037B
CLP SAMPLE ID	3097B-968	3037B-430	3097B-1082	3097B-200	3097B-1086	3097B-994	3037B-344
DATE SAMPLED	07/14/87	06/30/87	07/29/87	07/13/87	07/29/87	07/13/87	06/29/87
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THALLIUM	10.000 R	0.000 U	10.000 R	10.000 R	10.000 R	10.000 R	0.000 U
VANADIUM	50.000 R	0.000 U	50.000 R	50.000 R	50.000 R	50.000 R	0.000 U
ZINC	20.000 R	0.000 U	20.000 R	20.000 R	20.000 R	20.000 R	0.000 U
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
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- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
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- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 EP TOXICITY ANALYSES

DATE: 05/10/88
 PAGE 2

	(UG/L)							
SAMPLE ID	ER6A-B0	ER6A-BODUP	ER7-A0	ER8-A0	ER9-B0	ER9-BODUP	ER9A-E0	
CASE NUMBER	3097B	3097B	3097B	3037B	3037B	3037B	3097B	
CLP SAMPLE ID	3097B-989	3097B-990	3097B-991	3037B-359	3037B-447	3037B-448	3097B-987	
DATE SAMPLED	07/16/87	07/16/87	07/15/87	06/29/87	07/01/87	07/01/87	07/07/87	
ALUMINUM	200.000 R	200.000 R	200.000 R	0.000 U	0.000 U	0.000 U	200.000 R	
ANTIMONY	60.000 R	60.000 R	60.000 R	0.000 U	0.000 U	0.000 U	60.000 R	
ARSENIC	10.000 U	10.000 U	85.000	92.000	80.000 U	80.000 U	23.000	
BARIUM	75.000 J	9.000 J	56.000 J	288.000	60.000	60.000	56.000 J	
BERYLLIUM	5.000 R	5.000 R	5.000 R	0.000 U	0.000 U	4.300 U	5.000 R	
CADMIUM	4.000 U	4.000 U	4.000 U	4.300 U	4.300 U	0.000 U	4.000 U	
CALCIUM	5000.000 R	5.000 R	5000.000 R	0.000 U	0.000 U	10.000 J	5000.000 R	
CHROMIUM	4.000 U	4.000 U	4.000 U	7.800 U	7.800 U	10.000 J	4.000 U	
COBALT	50.000 R	50.000 R	50.000 R	0.000 U	0.000 U	0.000 U	50.000 R	
COPPER	25.000 R	25.000 R	25.000 R	0.000 U	0.000 U	0.000 U	25.000 R	
IRON	100.000 R	100.000 R	100.000 R	0.000 U	0.000 U	0.000 U	100.000 R	
LEAD	5.000 U	5.000 U	5.000 U	88.000	220.000	300.000	5.000 U	
CYANIDE	10.000 R	10.000 R	10.000 R	0.000 U	0.000 U	0.000 U	10.000 R	
MAGNESIUM	5000.000 R	5000.000 R	5000.000 R	0.000 U	0.000 U	0.000 U	5000.000 R	
MANGANESE	15.000 R	15.000 R	15.000 R	0.000 U	0.000 U	0.000 U	15.000 R	
MERCURY	0.200 U	0.200 U	0.200 U	2.000 U	2.000 U	2.000 U	0.200 U	
NICKEL	40.000 R	40.000 R	40.000 R	0.000 U	0.000 U	0.000 U	40.000 R	
POTASSIUM	5000.000 R	5.000 R	5000.000 R	0.000 U	0.000 U	50.000 U	5000.000 R	
SELENIUM	5.000 U	5.000 U	5.000 U	80.000 U	80.000 U	9.000 U	5.000 U	
SILVER	4.000 U	4.000 U	4.000 U	9.000 U	9.000 U	0.000 U	4.000 U	
SODIUM	5000.000 R	5000.000 R	5000.000 R	0.000 U	0.000 U	0.000 U	5000.000 R	

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 EP TOXICITY ANALYSES

DATE: 05/10/88
 PAGE 2 (CONT.)

	(UG/L)							
SAMPLE ID	(UG/L)							
CASE NUMBER	ER6A-B0		ER6A-BODUP		ER7-A0		ER8-A0	
CLP SAMPLE ID	3097B		3097B		3097B		3037B	
DATE SAMPLED	07/16/87		07/16/87		07/15/87		06/29/87	
THALLIUM	10.000	R	10.000	R	10.000	R	0.000	U
VANADIUM	50.000	R	50.000	R	50.000	R	0.000	U
ZINC	20.000	R	20.000	R	20.000	R	0.000	U
SOLIDS (%)	0.000		0.000		0.000		0.000	

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

002 0919 VIN

VINELAND CHEMICAL COMPANY SITE
SEDIMENT SAMPLES
EP TOXICITY ANALYSES

DATE: 05/10/88
PAGE 3

	ER9C-A0	ER9D-B0	ER9E-E0	ER9F-B0	ER10A-A0	ER11-A0
SAMPLE ID						
CASE NUMBER	3097B	3037B	3097B	3097B	3097B	3037B
CLP SAMPLE ID	3097B-997	3037B-402	3097B-995	3097B-993	3097B-992	3037B-310
DATE SAMPLED	07/09/87	06/30/87	07/10/87	07/06/87	07/08/87	06/23/87
ALUMINUM	200.000 R	0.000 U	200.000 R	200.000 R	200.000 R	0.000 U
ANTIMONY	60.000 R	0.000 U	60.000 R	60.000 R	60.000 R	0.000 U
ARSENIC	10.000 U	80.000 U	100.000	33.000	19.000	80.000 U
BARIUM	70.000 J	292.000	156.000 J	50.000 J	298.000	271.000
BERYLLIUM	5.000 R	0.000 U	5.000 R	5.000 R	5.000 R	0.000 U
CADMIUM	4.000 U	4.300 U	4.000 U	4.000 U	5.400	4.300 U
CALCIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	0.000 U
CHROMIUM	6.000 U	7.800 U	6.000 U	4.000 U	4.000 U	7.800 U
COBALT	50.000 R	0.000 U	50.000 R	50.000 R	50.000 R	0.000 U
COPPER	25.000 R	0.000 U	25.000 R	25.000 R	25.000 R	0.000 U
IRON	100.000 R	0.000 U	100.000 R	100.000 R	100.000 R	0.000 U
LEAD	11.000	64.000 U	5.000 U	5.000 U	5.000 U	640.000 U
CYANIDE	10.000 R	0.000 U	10.000 R	10.000 R	10.000 R	0.000 U
MAGNESIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	0.000 U
MANGANESE	15.000 R	0.000 U	15.000 R	15.000 R	15.000 R	0.000 U
MERCURY	0.200 U	2.000 U	0.200 U	0.200 U	0.200 U	2.000
NICKEL	40.000 R	0.000 U	40.000 R	40.000 R	40.000 R	0.000 U
POTASSIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	0.000 U
SELENIUM	5.000 U	80.000 U	5.000 U	5.000 U	5.000 U	80.000 U
SILVER	4.000 U	9.000 U	4.000 U	4.000 U	4.000 U	9.000 U
SODIUM	5000.000 R	0.000 U	5000.000 R	5000.000 R	5000.000 R	0.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TOTAL IDENTIFIED COMPOUNDS)

0920 002 VIA

VINELAND CHEMICAL COMPANY SITE
 SEDIMENT SAMPLES
 EP TOXICITY ANALYSES

DATE: 05/10/88
 PAGE 3 (CONT.)

SAMPLE ID	ER9C-A0	ER9D-B0	ER9E-E0	ER9F-B0	ER10A-A0	ER11-A0
CASE NUMBER	3097B	3037B	3097B	3097B	3097B	3037B
CLP SAMPLE ID	3097B-997	3037B-402	3097B-995	3097B-993	3097B-992	3037B-310
DATE SAMPLED	07/09/87	06/30/87	07/10/87	07/06/87	07/06/87	06/23/87
	-----	-----	-----	-----	-----	-----
THALLIUM	10.000 R	0.000 U	10.000 R	10.000 R	10.000 R	0.000 U
VANADIUM	50.000 R	0.000 U	50.000 R	50.000 R	50.000 R	0.000 U
ZINC	20.000 R	0.000 U	20.000 R	20.000 R	20.000 R	0.000 U
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
 - (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 BIOTA SAMPLES
 ARSENIC ANALYSES

<u>DESCRIPTION</u>	<u>CLP SAMPLE ID</u>	<u>DATE SAMPLED</u>	<u>ARSENIC (mg/kg)</u>
ER8-White Bass	3097B-901	7/15/87	2U
ER8-Bluegill	3097B-902	7/15/87	2U
ER8-Black Bullhead	3097B-903	7/15/87	0.91
Lower Maurice-Catfish	3097B-1261	8/5/87	1U
Lower Maurice-Crab Backfin	3097B-1263	8/7/87	1.5
Lower Maurice-Crab Hepatopancreas	3097B-1262	8/7/87	1.6
Delaware Bay-American Oyster	3097B-1265	8/13/87	1.2
Lower Maurice-American Oyster	3097B-1268A	8/13/87	1.3
Lower Maurice-Yellow Perch	3097B-1260	8/5/87	1U

VINELAND CHEMICAL COMPANY SITE
 BIOTA SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1

SAMPLE ID	3140B-905	3140B-906	3140B-907
CASE NUMBER	CATFISH	BLK BULLHEAD	BLK BULLHEAD
CLP SAMPLE ID	3140B-905	3140B-906	3140B-907
DATE SAMPLED	07/21/87	07/21/87	07/21/87
-----	-----	-----	-----
ALPHA-BHC	0.100 U	0.100 U	0.100 U
BETA-BHC	0.100 U	0.100 U	0.100 U
DELTA-BHC	0.100 U	0.100 U	0.100 U
GAMMA-BHC	0.100 U	0.100 U	0.100 U
HEPTACHLOR	0.100 U	0.100 U	0.100 U
ALDRIN	0.100 U	0.100 U	0.100 U
HEPTACHLOR EPOXIDE	0.100 U	0.100 U	0.100 U
ENDOSULFAN I	0.100 U	0.100 U	0.100 U
DIELDRIN	0.100 U	0.100 U	0.100 U
4-4-DDE	0.100 U	0.100 U	0.100 U
ENDRIN	0.100 U	0.100 U	0.100 U
ENDOSULFAN II	0.100 U	0.100 U	0.100 U
4-4-DDD	0.100 U	0.100 U	0.100 U
ENDOSULFAN SULFATE	0.100 U	0.100 U	0.100 U
4-4-DDT	0.100 U	0.100 U	0.100 U
METHOXYCHLOR	0.500 U	0.500 U	0.500 U
ENDRIN KETONE	0.100 U	0.100 U	0.100 U
CHLORDANE	0.500 U	0.500 U	0.500 U
TOXAPHENE	0.500 U	0.500 U	0.500 U
ACROCHLOR 1016	0.500 U	0.500 U	0.500 U
ACROCHLOR 1221	0.500 U	0.500 U	0.500 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
 B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 R - NOT REQUIRED FOR ANALYSIS
 X - REJECTED VALUE
 A - TICS ANALYZED FOR BUT NOT FOUND

COMPOUNDS)

VIN 002 0923

VINELAND CHEMICAL COMPANY SITE
 BIOTA SAMPLES
 PESTICIDE/PCB ANALYSES
 (UG/KG)

DATE: 05/10/88
 PAGE 1 (CONT.)

SAMPLE ID	3140B-905	3140B-906	3140B-907
CASE NUMBER	CATFISH	BLK BULLHEAD	BLK BULLHEAD
CLP SAMPLE ID	3140B-905	3140B-906	3140B-907
DATE SAMPLED	07/21/87	07/21/87	07/21/87

AROCHLOR 1232	0.500 U	0.500 U	0.500 U
AROCHLOR 1242	0.500 U	0.500 U	0.500 U
AROCHLOR 1248	0.500 U	0.500 U	0.500 U
AROCHLOR 1254	0.500 U	0.500 U	0.500 U
AROCHLOR 1260	0.500 U	0.500 U	0.500 U

EXPLANATION OF CODES:

 J - ESTIMATED VALUE
 B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 R - NOT REQUIRED FOR ANALYSIS
 X - REJECTED VALUE
 A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1

SAMPLE ID FB72987
CASE NUMBER 7729
CLP SAMPLE ID BL-023
DATE SAMPLED 07/29/87

CHLOROMETHANE	10.000	U
BROMOMETHANE	10.000	U
VINYL CHLORIDE	10.000	U
CHLOROETHANE	10.000	U
METHYL CHLORIDE	3.000	J
ACETONE	31.000	X
CARBON DISULFIDE	5.000	U
1,1-DICHLOROETHENE	5.000	U
1,1-DICHLOROETHANE	5.000	U
TRANS-1,2-DICHLOROETHENE	5.000	U
CHLOROFORM	5.000	U
1,2-DICHLOROETHANE	5.000	U
2-BUTANONE	10.000	X
1,1,1-TRICHLOROETHANE	5.000	U
CARBON TETRACHLORIDE	5.000	U
VINYL ACETATE	10.000	U
BROMODICHLOROMETHANE	5.000	U
1,2-DICHLOROPROPANE	5.000	U
TRANS-1,3-DICHLOROPROPENE	5.000	U
TRICHLOROETHENE	5.000	U
DIBROMOCHLOROMETHANE	5.000	U

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1 (CONT.)

SAMPLE ID F872987
CASE NUMBER 7729
CLP SAMPLE ID BL-023
DATE SAMPLED 07/29/87

1,1,2-TRICHLOROETHANE	5.000 U
BENZENE	5.000 U
CIS-1,3-DICHLOROPROPENE	5.000 U
2-CHLOROETHYL VINYLETHER	10.000 U
BROMOFORM	5.000 U
4-METHYL-2-PENTANONE	10.000 U
2-HEXANONE	10.000 U
TETRACHLOROETHENE	5.000 U
1,1,2,2-TETRACHLOROETHANE	5.000 U
TOLUENE	5.000 U
CHLOROBENZENE	5.000 U
ETHYLBENZENE	5.000 U
STYRENE	5.000 U
TOTAL XYLEMES	5.000 U
 TOTAL TICS	0.000
TIC CONCENTRATION	0.000 A

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

926 002 VIN

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
BNA ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1

SAMPLE ID FB72987
CASE NUMBER 7729
CLP SAMPLE ID BL-023
DATE SAMPLED 07/29/87

PHENOL	10.000	U
BIS[2-CHLOROETHYL] ETHER	10.000	U
2-CHLOROPHENOL	10.000	U
1,3-DICHLOROBENZENE	10.000	U
1,4-DICHLOROBENZENE	10.000	U
BENZYL ALCOHOL	10.000	U
1,2-DICHLOROBENZENE	10.000	U
2-METHYLPHENOL	10.000	U
BIS[2-CHLOROISOPROPYL] ETHER	10.000	U
4-METHYLPHENOL	10.000	U
N-NITROSO-DIPROPYLAMINE	10.000	U
HEXACHLORETHANE	10.000	U
NITROBENZENE	10.000	U
ISOPHORONE	10.000	U
2-NITROPHENOL	10.000	U
2,4-DIMETHYLPHENOL	10.000	U
BENZOIC ACID	50.000	U
BIS[2-CHLOROETHOXY] METHANE	10.000	U
2,4-DICHLOROPHENOL	10.000	U
2,2,4-TRICHLOROBENZENE	10.000	U
NAPHTHALENE	10.000	U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND

INITIALLY IDENTIFIED COMPOUNDS)

7260 002 NIA

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
BNA ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1 (CONT.)

SAMPLE ID FB72987
CASE NUMBER 7729
CLP SAMPLE ID BL-023
DATE SAMPLED 07/29/87

4-CHLOROANILINE 10.000 U
HEXACHLOROBUTADIENE 10.000 U
4-CHLORO-3-METHYLPHENOL 10.000 U
2-METNAPHTHALENE 10.000 U
HEXAACL CYCLOPENTADIENE 10.000 U
2,4,6-TRICHLOROPHENOL 10.000 U
2,4,5-TRICHLOROPHENOL 50.000 U
2-CHLORONAPHTHALENE 10.000 U
2-NITROANILINE 50.000 U
DIMETHYL PHTHALATE 10.000 U
ACENAPHTHYLENE 10.000 U
3-NITROANILINE 50.000 X
ACENAPHTHENE 10.000 U
2,4-DINITROPHENOL 50.000 U
4-NITROPHENOL 50.000 U
DIBENZOFURAN 10.000 U
2,4-DINITROTOLUENE 10.000 U
2,6-DINITROTOLUENE 10.000 U
DIETHYLPHTHALATE 10.000 U
4-CHLOROPHENYL PHENYL ETHER 10.000 U
FLUORENE 10.000 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE

DUND
8260 200 NIA 002 0928
(ED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
BNA ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1 (CONT.)

SAMPLE ID FB72987
CASE NUMBER 7729
CLP SAMPLE ID BL-023
DATE SAMPLED 07/29/87

4-NITROANILINE 50.000 U
4,6-DINITRO-2-METHYLPHENOL 50.000 U
N-NITROSODIPHENYLAMINE 10.000 U
4-BROMOPHENYL PHENYL ETHER 10.000 U
HEXACHLOROBENZENE 10.000 U
PENTACHLOROPHENOL 50.000 U
PHENANTHRENE 10.000 U
ANTHRACENE 10.000 U
DI-n-BUTYLPHthalATE 10.000 U
FLUORANTHRENE 10.000 U
PYRENE 10.000 U
BUTYL BENZYL PHthalATE 10.000 U
3,3-DICHLOROBENZIDINE 20.000 U
BENZO[a]ANTHRACENE 10.000 U
BIS[2-ETHYLHEXYL]PHthalATE 0.300 J
CHRYSENE 10.000 U
DI-n-OCTYL PHthalATE 10.000 U
BENZO[b]FLUORANTHRENE 10.000 U
BENZO[k]FLUORANTHRENE 10.000 U
BENZO[a]PYRENE 10.000 U
INDENO[1,2,3-CD]PYRENE 10.000 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE

6929 002 VIN 0929
KUND
ED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
BNA ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1 (CONT.)

SAMPLE ID F872987
CASE NUMBER 7729
CLP SAMPLE ID 8L-023
DATE SAMPLED 07/29/87

DIBENZO[A,H]ANTHRACENE 10.000 U
BENZO[G,H,I]PERYLENE 10.000 U

TOTAL TICS 0.000
TIC CONCENTRATION 0.000 R

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
PESTICIDE/PCB ANALYSES
(UG/L)

DATE: 05/11/88
PAGE 1

SAMPLE ID FB72987
CASE NUMBER 7729
CLP SAMPLE ID BL-023
DATE SAMPLED 07/29/87

ALPHA-BHC 0.050 U
BETA-BHC 0.050 U
DELTA-BHC 0.050 U
GAMMA-BHC 0.050 U
HEPTACHLOR 0.050 U
ALDRIN 0.050 U
HEPTACHLOR EPOXIDE 0.050 U
ENDOSULFAN I 0.050 U
DIELDRIN 0.100 U
4-4-DDE 0.100 U
ENDRIN 0.100 U
ENDOSULFAN II 0.100 U
4-4-DDD 0.100 U
ENDOSULFAN SULFATE 0.100 U
4-4-DDT 0.100 U
METHOXYCHLOR 0.500 U
ENDRIN KETONE 0.100 U
CHLORDANE 0.500 U
TOXAPHENE 1.000 U
ACROCHLOR 1016 0.500 U
ACROCHLOR 1221 0.500 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE

/ TE60 200 NIA ID
COMPounds)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - RIVER AREA
PESTICIDE/PCB ANALYSES
(UG/L)

DATE: 05/11/88
PAGE 1 (CONT.)

SAMPLE ID F872987
CASE NUMBER 7729
CLP SAMPLE ID BL-023
DATE SAMPLED 07/29/87

AROCHLOR 1232 0.500 U
AROCHLOR 1242 0.500 U
AROCHLOR 1248 0.500 U
AROCHLOR 1254 1.000 U
AROCHLOR 1260 1.000 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - RIVER AREA
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1

SAMPLE ID	FB71087	FB72987	FB72987	FB8687D	FB8687D	FB8687E	FB8687K
CASE NUMBER	3097B	7729	3097B	7782	3097B	3097B	3097B
CLP SAMPLE ID	3097B-126	MBJ-794	3097B-1106	MBL-245	3097B-1278	3097B-1279	3097B-1280
DATE SAMPLED	07/10/87	07/29/87	07/29/87	08/06/87	08/06/87	08/06/87	08/06/87
-----	-----	-----	-----	-----	-----	-----	-----
ALUMINUM	200.000 R	100.000 U	0.000 U	143.000 U	0.000 U	0.000 U	0.000 U
ANTIMONY	60.000 R	33.000 U	0.000 U	3.000 U	0.000 U	0.000 U	0.000 U
ARSENIC	4.000 U	12.000 U	4.000 U	1.500 U	5.000 U	5.000 U	5.000 U
BARIUM	200.000 R	40.000 U	0.000 U	30.000 U	0.000 U	0.000 U	0.000 U
BERYLLIUM	5.000 R	4.000 U	0.000 U	2.100 U	0.000 U	0.000 U	0.000 U
CADMIUM	5.000 R	4.000 U	0.000 U	5.000 X	0.000 U	0.000 U	0.000 U
CALCIUM	5000.000 R	740.000 U	0.000 U	629.000 U	0.000 U	0.000 U	0.000 U
CHROMIUM	10.000 R	9.000 U	0.000 U	9.400 U	0.000 U	0.000 U	0.000 U
COBALT	50.000 R	7.000 U	0.000 U	38.000 U	0.000 U	0.000 U	0.000 U
COPPER	25.000 R	17.000 U	0.000 U	16.000 U	0.000 U	0.000 U	0.000 U
IRON	100.000 R	100.000 U	30.000 U	45.000 U	0.000 R	111.000 J	100.000 R
LEAD	5.000 R	5.000 X	0.000 U	2.900 U	0.000 U	0.000 U	0.000 U
CYANIDE	10.000 R	10.000 R	0.000 U	10.000 R	0.000 U	0.000 U	0.000 U
MAGNESIUM	5000.000 R	344.000 U	0.000 U	182.000 J	0.000 U	0.000 U	0.000 U
MANGANESE	15.000 R	6.000 U	0.000 U	6.500 U	0.000 U	0.000 U	0.000 U
MERCURY	0.200 R	0.200 U	0.000 U	0.200 U	0.000 U	0.000 U	0.000 U
NICKEL	40.000 R	6.000 U	0.000 U	28.000 U	0.000 U	0.000 U	0.000 U
POTASSIUM	5000.000 R	500.000 U	0.000 U	584.000 U	0.000 U	0.000 U	0.000 U
SELENIUM	5.000 R	2.000 U	0.000 U	5.000 X	0.000 U	0.000 U	0.000 U
SILVER	10.000 R	7.000 U	0.000 U	7.700 U	0.000 U	0.000 U	0.000 U
SODIUM	5000.000 R	1045.000 U	0.000 U	1490.000 J	0.000 U	0.000 U	0.000 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

--- NOT FOUND

E69

020

NIA

(COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - RIVER AREA
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1 (CONT.)

SAMPLE ID	FB71087	FB72987	FB72987	FB8687D	FB8687D	FB8687E	FB8687K
CASE NUMBER	3097B	7729	3097B	7782	3097B	3097B	3097B
CLP SAMPLE ID	3097B-126	MBJ-794	3097B-1106	MBL-245	3097B-1278	3097B-1279	3097B-1280
DATE SAMPLED	07/10/87	07/29/87	07/29/87	08/06/87	08/06/87	08/06/87	08/06/87
	-----	-----	-----	-----	-----	-----	-----
THALLIUM	10.000 R	8.000 U	0.000 U	10.000 X	0.000 U	0.000 U	0.000 U
VANADIUM	50.000 R	12.000 U	0.000 U	23.000 U	0.000 U	0.000 U	0.000 U
ZINC	20.000 R	7.000 U	0.000 U	172.000	0.000 U	0.000 U	0.000 U
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - SITE AND RIVER AREAS
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1

SAMPLE ID	FB63087	FB71487C	FB71687	FB92987
CASE NUMBER	7537	7615	7615	8148
CLP SAMPLE ID	BL-449	BK-470	BK-737	BN-387
DATE SAMPLED	06/30/87	07/14/87	07/16/87	09/29/87
-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U	100.000 U	200.000 U	10.000 U
BROMOMETHANE	10.000 U	100.000 U	200.000 U	10.000 U
VINYL CHLORIDE	10.000 U	100.000 U	200.000 U	10.000 U
CHLOROETHANE	10.000 U	100.000 U	200.000 U	10.000 U
METHYL CHLORIDE	3.000 J	16.000 JB	100.000 U	5.000 U
ACETONE	32.000 X	1000.000	2800.000 B	54.000 X
CARBON DISULFIDE	5.000 U	50.000 U	100.000 U	5.000 U
1,1-DICHLOROETHENE	5.000 U	50.000 U	100.000 U	5.000 U
1,1-DICHLOROETHANE	5.000 U	50.000 U	100.000 U	5.000 U
TRANS-1,2-DICHLOROETHENE	5.000 U	50.000 U	100.000 U	5.000 R
CHLOROFORM	5.000 U	50.000 U	100.000 U	5.000 U
1,2-DICHLOROETHANE	5.000 U	50.000 U	100.000 U	5.000 U
2-BUTANONE	10.000 U	100.000 U	200.000 U	10.000 U
1,1,1-TRICHLOROETHANE	5.000 U	50.000 U	100.000 U	5.000 U
CARBON TETRACHLORIDE	5.000 U	50.000 U	100.000 U	5.000 U
VINYL ACETATE	10.000 U	100.000 U	200.000 U	10.000 U
BROMODICHLOROMETHANE	5.000 U	50.000 U	100.000 U	5.000 U
1,2-DICHLOROPROPANE	5.000 U	50.000 U	100.000 U	5.000 U
TRANS-1,3-DICHLOROPROPENE	5.000 U	50.000 U	100.000 U	5.000 U
TRICHLOROETHENE	5.000 U	50.000 U	100.000 U	5.000 U
DIBROMOCHLOROMETHANE	5.000 U	50.000 U	100.000 U	5.000 U

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS - TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - SITE AND RIVER AREAS
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1 (CONT.)

SAMPLE ID	FB63087	FB71487C	FB71687	FB92987
CASE NUMBER	7537	7615	7615	8148
CLP SAMPLE ID	BL-449	BK-470	BK-737	BN-387
DATE SAMPLED	06/30/87	07/14/87	07/16/87	09/29/87
-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U	50.000 U	100.000 U	5.000 U
BENZENE	5.000 U	50.000 U	100.000 U	5.000 U
CIS-1,3-DICHLOROPROPENE	5.000 U	50.000 U	100.000 U	5.000 U
2-CHLOROETHYL VINYLETHER	10.000 U	100.000 U	200.000 U	10.000 R
BROMOFORM	5.000 U	50.000 U	100.000 U	5.000 U
4-METHYL-2-PENTANONE	10.000 U	100.000 U	200.000 U	10.000 U
2-HEXANONE	10.000 U	100.000 U	200.000 U	10.000 U
TETRACHLOROETHENE	5.000 U	50.000 U	100.000 U	5.000 U
1,1,2,2-TETRACHLOROETHANE	5.000 U	50.000 U	100.000 U	5.000 U
TOLUENE	5.000 U	12.000 J	21.000 J	5.000 U
CHLOROBENZENE	5.000 U	50.000 U	100.000 U	5.000 U
ETHYL BENZENE	5.000 U	50.000 U	100.000 U	5.000 U
STYRENE	5.000 U	50.000 U	100.000 U	5.000 U
TOTAL XYLEMES	5.000 U	50.000 U	100.000 U	5.000 U
TOTAL TICS	0.000	0.000	0.000	1.000
TIC CONCENTRATION	0.000 A	0.000 A	0.000 A	5.000 A

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - SITE AND RIVER AREAS
 BNA ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1

SAMPLE ID	FB63087	FB71487C
CASE NUMBER	7537	7615
CLP SAMPLE ID	BL-449	BK-470
DATE SAMPLED	06/30/87	07/14/87
	-----	-----

PHENOL	20.000	U	10.000	U
BIS[2-CHLOROETHYL] ETHER	20.000	U	10.000	U
2-CHLOROPHENOL	20.000	U	10.000	U
1,3-DICHLOROBENZENE	20.000	U	10.000	U
1,4-DICHLOROBENZENE	20.000	U	10.000	U
BENZYL ALCOHOL	20.000	U	10.000	U
1,2-DICHLOROBENZENE	20.000	U	10.000	U
2-METHYLPHENOL	20.000	U	10.000	U
BIS[2-CHLOROISOPROPYL] ETHER	20.000	U	10.000	U
4-METHYLPHENOL	20.000	U	10.000	U
N-NITROSO-DIPROPYLAMINE	20.000	U	10.000	U
HEXACHLORETHANE	20.000	U	10.000	U
NITROBENZENE	20.000	U	10.000	U
ISOPHORONE	20.000	U	10.000	U
2-NITROPHENOL	20.000	U	10.000	U
2,4-DIMETHYLPHENOL	20.000	U	10.000	U
BENZOIC ACID	20.000	U	50.000	U
BIS[2-CHLOROETHOXY] METHANE	20.000	U	10.000	U
2,4-DICHLOROPHENOL	20.000	U	10.000	U
2,2,4-TRICHLOROBENZENE	20.000	U	10.000	U
NAPHTHALENE	20.000	U	10.000	U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND

D COMPOUNDS)

7E69 002 0937

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - SITE AND RIVER AREAS
 BNA ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1 (CONT.)

SAMPLE ID	FB63087	FB71487C
CASE NUMBER	7537	7615
CLP SAMPLE ID	BL-449	BK-470
DATE SAMPLED	06/30/87	07/14/87

4-CHLOROANILINE	20.000	U	10.000	U
HEXACHLOROBUTADIENE	20.000	U	10.000	U
4-CHLORO-3-METHYLPHENOL	20.000	U	10.000	U
2-METNAPHTHALENE	20.000	U	10.000	U
HEXAACL CYCLOPENTADIENE	20.000	U	10.000	U
2,4,6-TRICHLOROPHENOL	20.000	U	10.000	U
2,4,5-TRICHLOROPHENOL	100.000	U	50.000	U
2-CHLORONAPHTHALENE	20.000	U	10.000	U
2-NITROANILINE	100.000	U	50.000	U
DIMETHYL PHTHALATE	20.000	U	10.000	U
ACENAPHTHYLENE	20.000	U	10.000	U
3-NITROANILINE	100.000	U	50.000	U
ACENAPHTHENE	20.000	U	10.000	U
2,4-DINITROPHENOL	100.000	U	50.000	U
4-NITROPHENOL	100.000	U	50.000	U
DIBENZOFURAN	20.000	U	10.000	U
2,4-DINITROTOLUENE	20.000	U	10.000	U
2,6-DINITROTOLUENE	20.000	U	10.000	U
DIETHYLPHTHALATE	20.000	U	10.000	U
4-CHLOROPHENYL PHENYL ETHER	20.000	U	10.000	U
FLUORENE	20.000	U	10.000	U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- D - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - SITE AND RIVER AREAS
 BNA ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1 (CONT.)

SAMPLE ID	FB63087	FB71487C
CASE NUMBER	7537	7615
CLP SAMPLE ID	BL-449	BK-470
DATE SAMPLED	06/30/87	07/14/87

4-NITROANILINE	100.000	U	50.000	U
4,6-DINITRO-2-METHYLPHENOL	100.000	U	50.000	U
N-NITROSOOIPHENYLAMINE	20.000	U	10.000	U
4-BROMOPHENYL PHENYL ETHER	20.000	U	10.000	U
HEXACHLOROBENZENE	20.000	U	10.000	U
PENTACHLOROPHENOL	100.000	U	50.000	U
PHENANTHRENE	20.000	U	10.000	U
ANTHRACENE	20.000	U	10.000	U
DI-n-BUTYLPHthalate	20.000	U	10.000	U
FLUORANTHRENE	20.000	U	10.000	U
PYRENE	20.000	U	10.000	U
BUTYL BENZYL PHTHALATE	20.000	U	10.000	U
3,3-DICHLOROBENZIDINE	40.000	U	20.000	U
BENZO[a]ANTHRACENE	20.000	U	10.000	U
BIS[2-ETHYLHEXYL]PHTHALATE	20.000	U	10.000	U
CHRYSENE	20.000	U	10.000	U
DI-n-OCTYL PHTHALATE	20.000	U	10.000	U
BENZO[b]FLUORANTHENE	20.000	U	10.000	U
BENZO[k]FLUORANTHENE	20.000	U	10.000	U
BENZO[a]PYRENE	20.000	U	10.000	U
INDENO[1,2,3-CD]PYRENE	20.000	U	10.000	U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS - TOTAL INSTRUMENT COUNT
 COMPOUNDS)

VIN 002 0939

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - SITE AND RIVER AREAS
BNA ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1 (CONT.)

SAMPLE ID	FB63087	FB71487C
CASE NUMBER	7537	7615
CLP SAMPLE ID	BL-449	BK-470
DATE SAMPLED	06/30/87	07/14/87

DIBENZO[A,H]ANTHRACENE	20.000 U	10.000 U
BENZO[G,H,I]PERYLENE	20.000 U	10.000 U
TOTAL TICS	1.000	3.000
TIC CONCENTRATION	222.000 A	130.000 JB

EXPLANATION OF CODES:

J - ESTIMATED VALUE
B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
R - NOT REQUIRED FOR ANALYSIS
X - REJECTED VALUE
A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - SITE AND RIVER AREAS
 PESTICIDE/PCB ANALYSES
 (UG/L)

DATE: 05/11/88
 PAGE 1

SAMPLE ID	FB63087	FB71487C	FB92987
CASE NUMBER	7537	7615	8148
CLP SAMPLE ID	BL-449	BK-470	BN-388
DATE SAMPLED	06/30/87	07/14/87	09/29/87
-----	-----	-----	-----
ALPHA-BHC	0.050 U	0.050 U	0.050 U
BETA-BHC	0.050 U	0.050 U	0.050 U
DELTA-BHC	0.050 U	0.050 U	0.050 U
GAMMA-BHC	0.050 U	0.050 U	0.050 U
HEPTACHLOR	0.050 U	0.050 U	0.050 U
ALDRIN	0.050 U	0.050 U	0.050 U
HEPTACHLOR EPOXIDE	0.050 U	0.050 U	0.050 U
ENDOSULFAN I	0.050 U	0.050 U	0.050 U
DIELDRIN	0.100 U	0.100 U	0.100 U
4-4-DDE	0.100 U	0.100 U	0.100 U
ENDRIN	0.100 U	0.100 U	0.100 U
ENDOSULFAN II	0.100 U	0.100 U	0.100 U
4-4-DDD	0.100 U	0.100 U	0.100 U
ENDOSULFAN SULFATE	0.100 U	0.100 U	0.100 U
4-4-DDT	0.100 U	0.100 U	0.100 U
METHOXYCHLOR	0.500 U	0.500 U	0.500 U
ENDRIN KETONE	0.100 U	0.100 U	0.100 U
CHLORDANE	0.500 U	0.500 U	0.500 U
TOXAPHENE	1.000 U	1.000 U	1.000 U
AROCHLOR 1016	0.500 U	0.500 U	0.500 U
AROCHLOR 1221	0.500 U	0.500 U	0.500 U

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - SITE AND RIVER AREAS
 PESTICIDE/PCB ANALYSES
 (UG/L)

DATE: 05/11/88
 PAGE 1 (CONT.)

SAMPLE ID	FB63087	FB71487C	FB92987
CASE NUMBER	7537	7615	8148
CLP SAMPLE ID	BL-449	BK-470	BN-388
DATE SAMPLED	06/30/87	07/14/87	09/29/87
	-----	-----	-----

AROCHLOR 1232	0.500 U	0.500 U	0.500 U
AROCHLOR 1242	0.500 U	0.500 U	0.500 U
AROCHLOR 1248	0.500 U	0.500 U	0.500 U
AROCHLOR 1254	1.000 U	1.000 U	1.000 U
AROCHLOR 1260	1.000 U	1.000 U	1.000 U

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- D - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - SITE AND RIVER AREAS
INORGANIC ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1

SAMPLE ID	FB63087	FB71087	FB71387	FB71487	FB71487A	FB71487C	FB71687
CASE NUMBER	7537	30978	3097B	3097B	3097B	7615	7615
CLP SAMPLE ID	MBI-541	3097B-243	3097B-244	3097B-245	3097B-238	MBJ-701	MBJ-707
DATE SAMPLED	06/30/87	07/10/87	07/13/87	07/14/87	07/14/87	07/14/87	07/16/87
-----	-----	-----	-----	-----	-----	-----	-----
ALUMINUM	100.000 U	0.000 U	0.000 U	0.000 U	0.000 U	47.000 U	47.000 U
ANTIMONY	33.000 U	0.000 U	0.000 U	0.000 U	0.000 U	20.000 U	20.000 U
ARSENIC	6.000 U	4.000 U	4.000 U	4.000 U	4.000 U	7.800 J	1.400 J
BARIUM	40.000 U	0.000 U	0.000 U	0.000 U	0.000 U	1.300 J	1.900 J
BERYLLIUM	4.000 U	0.000 U	0.000 U	0.000 U	0.000 U	3.700 U	3.700 U
CADMIUM	4.000 U	0.000 U	0.000 U	0.000 U	0.000 U	3.600 U	3.600 U
CALCIUM	740.000 U	0.000 U	0.000 U	0.000 U	0.000 U	974.000 J	893.000 J
CHROMIUM	9.000 U	0.000 U	0.000 U	0.000 U	0.000 U	7.600 U	7.600 U
COBALT	7.000 U	0.000 U	0.000 U	0.000 U	0.000 U	9.700 U	9.700 U
COPPER	17.000 U	0.000 U	0.000 U	0.000 U	0.000 U	11.000 U	12.000 J
IRON	100.000 U	347.000	195.000	219.000	100.000 X	132.000	137.000
LEAD	2.000 U	0.000 U	0.000 U	0.000 U	0.000 U	5.800	1.600 J
CYANIDE	10.000 R	0.000 U	0.000 U	0.000 U	0.000 U	10.000 R	10.000 R
MAGNESIUM	344.000 U	0.000 U	0.000 U	0.000 U	0.000 U	53.000 J	27.000 U
MANGANESE	6.000 U	0.000 U	0.000 U	0.000 U	0.000 U	2.100 U	3.000 J
MERCURY	0.200 U	0.000 U	0.000 U	0.000 U	0.000 U	0.200 U	0.200 U
NICKEL	8.300 J	0.000 U	0.000 U	0.000 U	0.000 U	33.000 U	32.000 U
POTASSIUM	500.000 U	0.000 U	0.000 U	0.000 U	0.000 U	327.000 U	327.000 U
SELENIUM	2.000 U	0.000 U	0.000 U	0.000 U	0.000 U	2.700 J	0.500 U
SILVER	7.000 U	0.000 U	0.000 U	0.000 U	0.000 U	4.900 U	4.900 U
SODIUM	1045.000 U	0.000 U	0.000 U	0.000 U	0.000 U	2240.000 J	2010.000 J

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 FIELD BLANK SAMPLES - SITE AND RIVER AREAS
 INORGANIC ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1 (CONT.)

SAMPLE ID	FB63087	FB71087	FB71387	FB71487	FB71487A	FB71487C	FB71687
CASE NUMBER	7537	3097B	3097B	3097B	3097B	7615	7615
CLP SAMPLE ID	MBI-541	3097B-243	3097B-244	3097B-245	3097B-238	MBJ-701	MBJ-707
DATE SAMPLED	06/30/87	07/10/87	07/13/87	07/14/87	07/14/87	07/14/87	07/16/87
	-----	-----	-----	-----	-----	-----	-----
THALLIUM	8.000 U	0.000 U	0.000 U	0.000 U	0.000 U	10.000 X	6.000 U
VANADIUM	12.000 U	0.000 U	0.000 U	0.000 U	0.000 U	5.300 U	5.300 U
ZINC	7.000 U	0.000 U	0.000 U	0.000 U	0.000 U	4.500 J	5.000 J
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - SITE AND RIVER AREAS
INORGANIC ANALYSES

DATE: 05/12/88
PAGE 2

SAMPLE ID	FB71687B	FB71687C	FB7787	FB7887	FB7987	FB92987	FB92987
CASE NUMBER	3097B	3097B	3097B	3097B	3097B	8148	8148
CLP SAMPLE ID	3097B-739	3097B-735	3097B-040	3097B-241	3097B-242	M8M-027	33128-077
DATE SAMPLED	07/16/87	07/16/87	07/07/87	07/08/87	07/09/87	09/29/87	09/29/87
	-----	-----	-----	-----	-----	-----	-----
ALUMINUM	0.000 U	0.000 U	200.000 R	0.000 U	0.000 U	90.000 U	200.000 R
ANTIMONY	0.000 U	0.000 U	60.000 R	0.000 U	0.000 U	60.000 U	60.000 R
ARSENIC	4.000 U	4.000 U	4.000 U	4.000 U	4.000 U	10.000 U	10.000 U
BARIUM	0.000 U	0.000 U	200.000 R	0.000 U	0.000 U	11.000 U	200.000 R
BERYLLIUM	0.000 U	0.000 U	5.000 R	0.000 U	0.000 U	1.000 U	5.000 R
CADMIUM	0.000 U	0.000 U	5.000 R	0.000 U	0.000 U	5.000 U	5.000 R
CALCIUM	0.000 U	0.000 U	5000.000 R	0.000 U	0.000 U	147.000 U	5000.000 R
CHROMIUM	0.000 U	0.000 U	10.000 R	0.000 U	0.000 U	9.000 U	10.000 R
COBALT	0.000 U	0.000 U	50.000 R	0.000 U	0.000 U	12.000 U	50.000 R
COPPER	0.000 U	0.000 U	25.000 R	0.000 U	0.000 U	14.000 U	25.000 R
IRON	182.000	100.000 XR	61.000 J	194.000	144.000	24.000 J	100.000 R
LEAD	0.000 U	0.000 U	5.000 R	0.000 U	0.000 U	5.000 U	5.000 R
CYANIDE	0.000 U	0.000 U	10.000 R	0.000 U	0.000 U	10.000 R	10.000 R
MAGNESIUM	0.000 U	0.000 U	5000.000 R	0.000 U	0.000 U	106.000 J	5000.000 R
MANGANESE	0.000 U	0.000 U	15.000 R	0.000 U	0.000 U	3.000 U	15.000 R
MERCURY	0.000 U	0.000 U	0.200 R	0.000 U	0.000 U	0.200 U	0.200 R
NICKEL	0.000 U	0.000 U	40.000 R	0.000 U	0.000 U	23.000 J	40.000 R
POTASSIUM	0.000 U	0.000 U	5000.000 R	0.000 U	0.000 U	629.000 U	5000.000 R
SELENIUM	0.000 U	0.000 U	5.000 R	0.000 U	0.000 U	5.000 X	5.000 R
SILVER	0.000 U	0.000 U	10.000 R	0.000 U	0.000 U	10.000 U	10.000 R
SODIUM	0.000 U	0.000 U	5000.000 R	0.000 U	0.000 U	1480.000 U	5000.000 R

EXPLANATION OF CODES:

J - ESTIMATED VALUE

B - COMPOUND FOUND IN BLANK

- DETECTED AT CONCENTRATION SHOWN

U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT

R - NOT REQUIRED FOR ANALYSIS

X - REJECTED VALUE

A - TICS ANALYZED FOR BUT NOT FOUND

(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

5945 002 VIN

VINELAND CHEMICAL COMPANY SITE
FIELD BLANK SAMPLES - SITE AND RIVER AREAS
INORGANIC ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 2 (CONT.)

SAMPLE ID	FB71687B	FB71687C	FB7787	FB7887	FB7987	FB92987	FB92987
CASE NUMBER	30978	30978	30978	30978	30978	8148	8148
CLP SAMPLE ID	30978-739	30978-735	30978-040	30978-241	30978-242	MBM-027	33128-077
DATE SAMPLED	07/16/87	07/16/87	07/07/87	07/08/87	07/09/87	09/29/87	09/29/87
-----	-----	-----	-----	-----	-----	-----	-----
THALLIUM	0.000 U	0.000 U	10.000 R	0.000 U	0.000 U	10.000 X	10.000 R
VANADIUM	0.000 U	0.000 U	50.000 R	0.000 U	0.000 U	7.000 U	50.000 R
ZINC	0.000 U	0.000 U	20.000 R	0.000 U	0.000 U	20.000 X	20.000 R
SOLIDS (%)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
 - (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 TRIP BLANK SAMPLES - RIVER AREA
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1

SAMPLE ID	TB71487	TB73087	TB7887
CASE NUMBER	7615	7729	7573
CLP SAMPLE ID	BK-467	BL-024	BL-468
DATE SAMPLED	07/14/87	07/30/87	07/08/87
-----	-----	-----	-----
CHLOROMETHANE	500.000 U	10.000 U	10.000 X
BROMOMETHANE	500.000 U	10.000 U	10.000 X
VINYL CHLORIDE	500.000 X	10.000 U	10.000 X
CHLOROETHANE	500.000 U	10.000 U	10.000 X
METHYL CHLORIDE	58.000 JB	3.000 J	10.000 X
ACETONE	3300.000	32.000 X	10.000 X
CARBON DISULFIDE	300.000 U	5.000 U	5.000 X
1,1-DICHLOROETHENE	300.000 U	5.000 U	5.000 X
1,1-DICHLOROETHANE	300.000 U	5.000 U	5.000 X
TRANS-1,2-DICHLOROETHENE	300.000 U	5.000 U	5.000 X
CHLOROFORM	300.000 U	5.000 U	5.000 X
1,2-DICHLOROETHANE	300.000 U	5.000 U	5.000 X
2-BUTANONE	500.000 U	10.000 X	3.000 J
1,1,1-TRICHLOROETHANE	300.000 U	5.000 U	5.000 X
CARBON TETRACHLORIDE	300.000 U	5.000 U	5.000 X
VINYL ACETATE	500.000 U	10.000 U	10.000 X
BROMODICHLOROMETHANE	300.000 U	5.000 U	5.000 X
1,2-DICHLOROPROPANE	300.000 U	5.000 U	5.000 X
TRANS-1,3-DICHLOROPROPENE	300.000 U	5.000 U	5.000 X
TRICHLOROETHENE	300.000 U	5.000 U	5.000 X
DIBROMOCHLOROMETHANE	300.000 U	5.000 U	5.000 X

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - 3 - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A -
- 740 002 VIN COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
 TRIP BLANK SAMPLES - RIVER AREA
 VOLATILES ANALYSES
 (UG/L)

DATE: 05/12/88
 PAGE 1 (CONT.)

SAMPLE ID	TB71487	TB73087	TB7887
CASE NUMBER	7615	7729	7573
CLP SAMPLE ID	BK-467	BL-024	BL-468
DATE SAMPLED	07/14/87	07/30/87	07/08/87
-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	300.000 U	5.000 U	5.000 X
BENZENE	300.000 U	5.000 U	5.000 X
CIS-1,3-DICHLOROPROPENE	300.000 U	5.000 U	5.000 X
2-CHLOROETHYL VINYL ETHER	500.000 U	10.000 U	10.000 X
BROMOFORM	300.000 U	5.000 U	5.000 X
4-METHYL-2-PENTANONE	500.000 U	10.000 U	10.000 X
2-HEXANONE	500.000 U	10.000 U	10.000 X
TETRACHLOROETHENE	300.000 U	5.000 U	5.000 X
1,1,2,2-TETRACHLOROETHANE	300.000 U	5.000 U	5.000 X
TOLUENE	300.000 U	5.000 U	1.000 X
CHLOROBENZENE	300.000 U	5.000 U	5.000 X
ETHYLBENZENE	300.000 U	5.000 U	5.000 X
STYRENE	300.000 U	5.000 U	5.000 X
TOTAL XYLEMES	300.000 U	5.000 U	5.000 X
TOTAL TICS	0.000	0.000	2.000
TIC CONCENTRATION	0.000 A	0.000 A	37.000 A

EXPLANATION OF CODES:

-
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 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
- (TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
TRIP BLANK SAMPLES - SITE AND RIVER AREAS
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1

SAMPLE ID	TB62387	TB62687	TB63087	TB71587	TB7187	TB7787	TB7987B
CASE NUMBER	7508	7508	7537	7615	7537	7537	7573
CLP SAMPLE ID	BJ-924	BL-440	BL-450	BK-734	BL-451	BL-461	BK-462
DATE SAMPLED	06/23/87	06/26/87	06/30/87	07/15/87	07/01/87	07/07/87	07/09/87
-----	-----	-----	-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	10.000 X
BROMOMETHANE	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	10.000 X
VINYL CHLORIDE	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	10.000 X
CHLOROETHANE	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	10.000 X
METHYL CHLORIDE	10.000 U	5.000 U	3.000 J	200.000 U	10.000 U	10.000 X	10.000 X
ACETONE	2900.000 B	480.000 B	76.000 B	3900.000 B	5.000 X	10.000 X	10.000 X
CARBON DISULFIDE	5.000 U	5.000 U	5.000 U	100.000 U	10.000 U	10.000 X	10.000 X
1,1-DICHLOROETHENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
1,1-DICHLOROETHANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
TRANS-1,2-DICHLOROETHENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
CHLOROFORM	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
1,2-DICHLOROETHANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
2-BUTANONE	11.000	10.000 U	10.000 U	86.000 J	10.000 U	10.000 X	3.000 J
1,1,1-TRICHLOROETHANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
CARBON TETRACHLORIDE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
VINYL ACETATE	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	5.000 X
BROMODICHLOROMETHANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
1,2-DICHLOROPROPANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
TRANS-1,3-DICHLOROPROPENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
TRICHLOROETHENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
DIBROMOCHLOROMETHANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
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- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- - - - - ANALYZED FOR BUT NOT FOUND

VINELAND CHEMICAL COMPANY SITE
TRIP BLANK SAMPLES - SITE AND RIVER AREAS
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 1 (CONT.)

SAMPLE ID	TB62387	TB62687	TB63087	TB71587	TB7187	TB7787	TB7987B
CASE NUMBER	7508	7508	7537	7615	7537	7537	7573
CLP SAMPLE ID	BJ-924	BL-440	BL-450	BK-734	BL-451	BL-461	BK-462
DATE SAMPLED	06/23/87	06/26/87	06/30/87	07/15/87	07/01/87	07/07/87	07/09/87
-----	-----	-----	-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
BENZENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
CIS-1,3-DICHLOROPROPENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
2-CHLOROETHYL VINYL ETHER	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	10.000 X
BROMOFORM	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
4-METHYL-2-PENTANONE	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	10.000 X
2-HEXANONE	10.000 U	10.000 U	10.000 U	200.000 U	10.000 U	10.000 X	10.000 X
TETRACHLOROETHENE	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 X	5.000 X
1,1,2,2-TETRACHLOROETHANE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
TOLUENE	5.000 U	5.000 U	3.000 J	32.000 J	5.000 U	1.000 X	1.000 X
CHLOROBENZENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
ETHYLBENZENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
STYRENE	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
TOTAL XYLEMES	5.000 U	5.000 U	5.000 U	100.000 U	5.000 U	5.000 X	5.000 X
TOTAL TICS	0.000	0.000	2.000	0.000	4.000	1.000	1.000
TIC CONCENTRATION	0.000 A	0.000 A	173.000 A	0.000 A	308.000 A	12.000 J	20.000 J

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
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- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
TRIP BLANK SAMPLES - SITE AND RIVER AREAS
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 2

SAMPLE ID	TB91687	TB91787	TB91887	TB92987	TB93087
CASE NUMBER	8057	8057	8057	8148	8148
CLP SAMPLE ID	BN-203	BN-212	BN-235	BN-392	BN-409
DATE SAMPLED	09/16/87	09/17/87	09/18/87	09/29/87	09/30/87
-----	-----	-----	-----	-----	-----
CHLOROMETHANE	10.000 U	10.000 X	10.000 U	10.000 U	10.000 X
BROMOMETHANE	10.000 U	10.000 X	10.000 U	10.000 U	10.000 X
VINYL CHLORIDE	10.000 U	10.000 X	10.000 U	10.000 U	10.000 X
CHLOROETHANE	10.000 U	10.000 X	10.000 U	10.000 U	10.000 X
METHYL CHLORIDE	5.000 U	5.000 X	3.000 X	1.000 X	1.000 X
ACETONE	2100.000 X	600.000 EJ	10.000 U	31.000	210.000 BEJ
CARBON DISULFIDE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
1,1-DICHLOROETHENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
1,1-DICHLOROETHANE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
TRANS-1,2-DICHLOROETHENE	5.000 R	5.000 R	5.000 R	5.000 R	5.000 R
CHLOROFORM	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
1,2-DICHLOROETHANE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
2-BUTANONE	10.000 U	10.000 X	11.000	7.000 J	3.000 X
1,1,1-TRICHLOROETHANE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
CARBON TETRACHLORIDE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
VINYL ACETATE	10.000 U	10.000 X	10.000 U	10.000 U	10.000 X
BROMODICHLOROMETHANE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
1,2-DICHLOROPROPANE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
TRANS-1,3-DICHLOROPROPENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
TRICHLOROETHENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
DIBROMOCHLOROMETHANE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X

EXPLANATION OF CODES:

- J - ESTIMATED VALUE
- B - COMPOUND FOUND IN BLANK
- - DETECTED AT CONCENTRATION SHOWN
- U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
- R - NOT REQUIRED FOR ANALYSIS
- X - REJECTED VALUE
- A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

VINELAND CHEMICAL COMPANY SITE
TRIP BLANK SAMPLES - SITE AND RIVER AREAS
VOLATILES ANALYSES
(UG/L)

DATE: 05/12/88
PAGE 2 (CONT.)

SAMPLE ID	TB91687	TB91787	TB91887	TB92987	TB93087
CASE NUMBER	8057	8057	8057	8148	8148
CLP SAMPLE ID	BN-203	BN-212	BN-235	BN-392	BN-409
DATE SAMPLED	09/16/87	09/17/87	09/18/87	09/29/87	09/30/87
-----	-----	-----	-----	-----	-----
1,1,2-TRICHLOROETHANE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
BENZENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
CIS-1,3-DICHLOROPROPENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
2-CHLOROETHYL VINYLETHER	10.000 R				
BROMOFORM	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
4-METHYL-2-PENTANONE	10.000 U	10.000 X	10.000 U	10.000 U	10.000 X
2-HEXANONE	10.000 U	10.000 X	10.000 U	10.000 U	10.000 X
TETRACHLOROETHENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
1,1,2,2-TETRACHLOROETHANE	5.000 U	5.000 X	10.000 U	5.000 U	5.000 X
TOLUENE	5.000 U	2.000 J	2.000 J	5.000 U	5.000 X
CHLOROBENZENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
ETHYL BENZENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
STYRENE	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
TOTAL XYLEMES	5.000 U	5.000 X	5.000 U	5.000 U	5.000 X
TOTAL TICS	0.000	0.000	0.000	0.000	0.000
TIC CONCENTRATION	0.000 A				

EXPLANATION OF CODES:

-
- J - ESTIMATED VALUE
 - B - COMPOUND FOUND IN BLANK
 - DETECTED AT CONCENTRATION SHOWN
 - U - UNDETECTED AT GIVEN INSTRUMENT DETECTION LIMIT
 - R - NOT REQUIRED FOR ANALYSIS
 - X - REJECTED VALUE
 - A - TICS ANALYZED FOR BUT NOT FOUND
(TICS = TENTATIVELY IDENTIFIED COMPOUNDS)

APPENDIX C

VIN 002 0953

APPENDIX C

WATER BALANCE CALCULATIONS

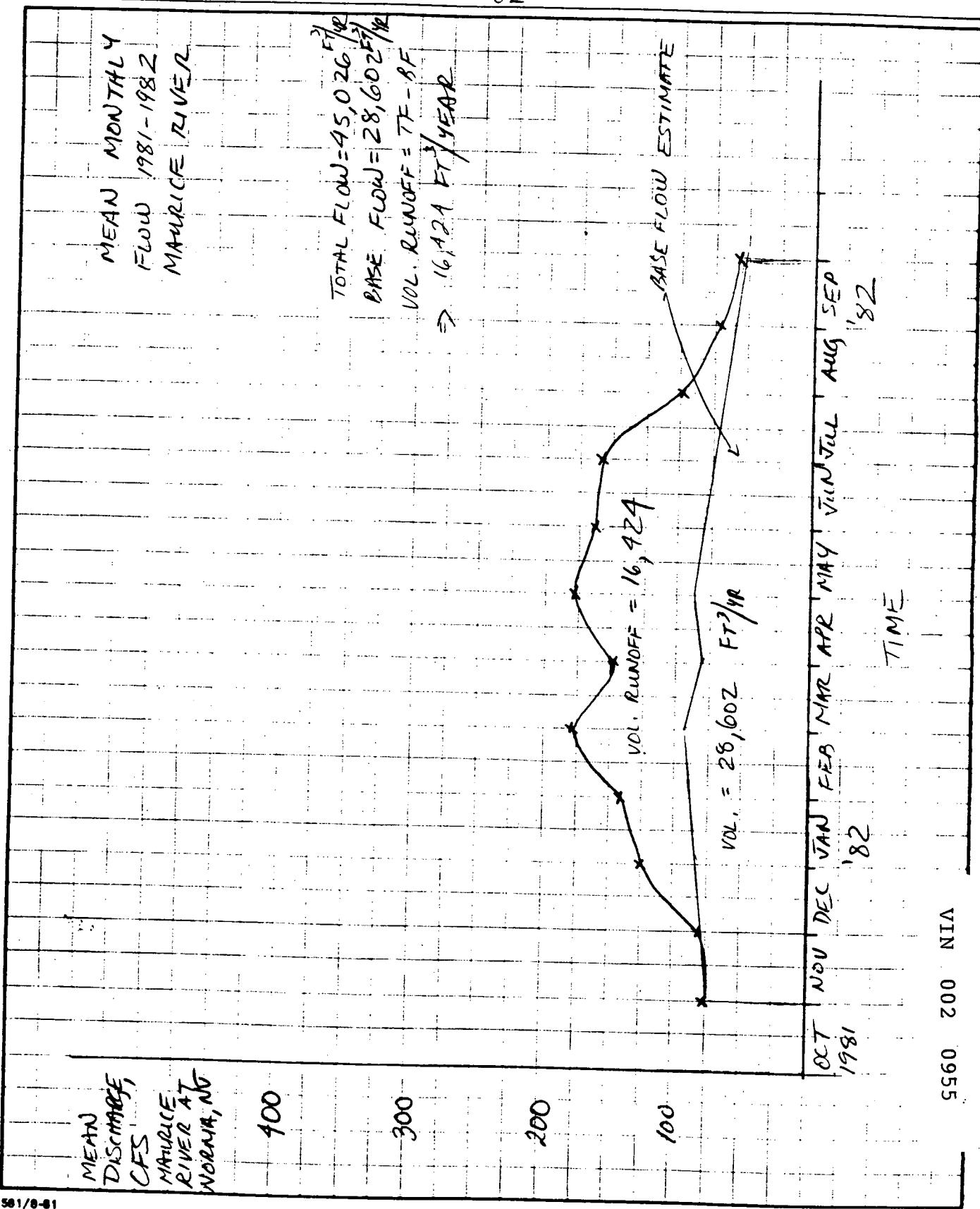
VIN 002 0954

8519b

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 1/29/88

CHKD. BY _____ DATE _____

CLIENT USEPAPROJECT VINELAND CHEMICAL COMPANYSUBJECT WATER BALANCE : 1981-1982SHEET _____ OF _____
DEPT. NO.

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 4/24/88

CHKD. BY _____ DATE _____

CLIENT USEPASHEET OF
DEPT. NO. PROJECT VINELAND CHEMICAL COMPANY SITE
SUBJECT WATER BUDGET 1981-1982OFS NO. MEAN TOTAL FLOW: 1981-1982

MONTH	AVERAGE DAILY FLOW (AT NORMA <small>MAURICE R.</small>)	X # DAYS =	Avg MONTHLY FLOW
OCT '81	77.3	CFS	x 31 = 2396.3
NOV '81	84.3		x 30 = 2529
DEC '81	125		x 31 = 3875
JAN '82	141		x 31 = 4371
FEB '82	178		x 28 = 4984
MAR '82	148		x 31 = 4588
APR '82	179		x 30 = 5370
MAY '82	163		x 31 = 5053
JUN '82	161		x 30 = 4830
JUL '82	98.8		x 31 = 3062.8
AUG '82	72.6		x 31 = 2250.6
SEP '82	57.2	↓	x 30 = 1716

MEAN TOTAL FLOW 45,025.7 FT³/HR

$$\text{MEAN TOTAL FLOW (FT}^3\text{)} \times \frac{1 \text{ YEAR}}{365 \text{ DAYS}} = \frac{\text{FT}^3}{\text{SEC}} = \text{MEAN TOTAL FLOW MAURICE RIVER}$$

$$\Rightarrow 45,025 \times \frac{1}{365} = 123.4 \text{ FT}^3/\text{SEC} = \text{MEAN TOTAL FLOW MAURICE RIVER}$$

VIN 002 0956

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 9/29/88

CHKD. BY _____ DATE _____

CLIENT USEPASHEET OF
OFS NO. DEPT. NO. PROJECT VINELAND CHEMICAL COMPANY
SUBJECT WATER BALANCE: 1981-1982BASE FLOW: 1981-1982

MONTH	AVERAGE DAILY BASE FLOW (FROM PLOT)	CFS	X # DAYS = AVG. MONTHLY BASE FLOW
OCT '81	77		X 31 = 2387 -
NOV '81	80		X 30 = 2400 -
DEC '81	85		X 31 = 2635 -
JAN '82	87		X 31 = 2697 -
FEB '82	90		X 28 = 2520 -
MAR '82	80		X 31 = 2480 -
APR '82	88		X 30 = 2640 -
MAY '82	90		X 31 = 2790 -
JUN '82	75		X 30 = 2250 -
JUL '82	71		X 31 = 2201 -
AUG '82	62		X 31 = 1922 -
SEP '82	56	V	X 30 = 1680 -

MEAN TOTAL BASE FLOW 28602 FT³/HR

$$\text{MEAN TOTAL BASE FLOW} \times \frac{1 \text{ YEAR}}{365 \text{ DAYS}} = \frac{\text{FT}^3}{\text{SEC}} = \text{AVG. BASE FLOW MAURICE RIVER}$$

(per year/ft³)

$$\Rightarrow 28,602 \times \frac{1}{365} = 78.4 \text{ FT}^3/\text{SEC} = \text{AVG. BASE FLOW MAURICE RIVER} \approx$$

VIN 002 0957

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 1/29/88

CHKD. BY _____ DATE _____

SHEET OF
DEPT. NO. CLIENT USEPAOFS NO. PROJECT VINELAND CHEMICAL COMPANY SITESUBJECT WATER BUDGET; 1981-1982PRECIPITATION: MILLVILLE FAA AIRPORT STATION

MONTH	TOTAL PRECIPITATION
OCT '81	3.23 INCHES
NOV '81	1.26
DEC '81	3.70
JAN '82	4.16
FEB '82	5.20
MAR '82	2.72
APR '82	5.56
MAY '82	2.43
JUN '82	2.65
JUL '82	4.56
AUG '82	2.22
SEP '82	0.93

$$\text{TOTAL PPT} = 38.62 \text{ inches}$$

$$\text{RAINFALL (in.)} \times \frac{1 \text{ FT}}{12 \text{ IN.}} \times \text{BASIN AREA (mi}^2\text{)} \times \frac{5280^2 \text{ FT}^2}{\text{mi}^2} \Rightarrow \frac{\text{FT}^3 \text{ RAIN}}{\text{yr}}$$

$$\Rightarrow 38.62 \times \frac{1}{12} \times 112 \times 5280^2$$

$$= 1.0 \times 10^{10} \text{ ft}^3/\text{year}$$

$$\frac{\text{FT}^3 \text{ RAIN}}{\text{YEAR}} \times \frac{1 \text{ YEAR}}{365 \text{ DAYS}} \times \frac{1 \text{ DAY}}{86,400} = \frac{\text{FT}^3 \text{ RAIN}}{\text{sec}}$$

$$\Rightarrow 1.0 \times 10^{10} \times \frac{1}{365} \times \frac{1}{86,400} = 318.6 \text{ ft}^3 \text{ rain/sec}$$

VIN 002 0958

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 7/5/88SHEET OF
DEPT. NO. CHKD. BY DATE OFS NO. CLIENT USEPAPROJECT VINELAND CHEMICAL SITESUBJECT WATER BUDGET: 1981-1982

$$\text{MEAN TOTAL FLOW} = 45,026 \text{ FT}^3/\text{YR}$$

$$= 123.4 \text{ FT}^3/\text{SEC} = 26 \text{ INCHES/YR}$$

$$\text{MEAN BASE FLOW} = 28,602 \text{ FT}^3/\text{YR}$$

$$= 78.4 \text{ FT}^3/\text{SEC} = 9.5 \text{ INCHES/YR}$$

RUNOFF

$$= \text{TOTAL FLOW} - \text{BASE FLOW}$$

$$= 45,026 - 28,602 \text{ FT}^3/\text{YR}$$

$$= 16,424 \text{ FT}^3/\text{YR}$$

$$= 45 \text{ FT}^3/\text{SEC} = 5.5 \text{ INCHES/YR}$$

RAINFALL

$$= 1.0 \times 10^{10} \text{ FT}^3/\text{YR}$$

$$= 318.6 \text{ FT}^3/\text{SEC} = 38.6 \text{ INCHES/YR}$$

$$\text{EVAPOTRANSPIRATION} = \text{TOTAL RAINFALL} - \text{TOTAL FLOW}$$

$$= 38.6 - 26 \text{ INCHES/YR}$$

$$= 23.6 \text{ INCHES/YR}$$

WATER BALANCE

$$\text{RAINFALL} = 38.6 \text{ INCHES/YR}$$

$$\text{BASEFLOW} = 9.5 \text{ INCHES/YR} = 25\%$$

$$\text{RUNOFF} = 5.5 \text{ INCHES/YR} = 14\%$$

$$\text{EVAPOTRANSPIRATION} = 23.6 \text{ INCHES/YR} = 61\%$$

BASE FLOW/UNIT AREA = BASE FLOW

DRAINAGE BASIN AREA

$$= 78.4 \text{ FT}^3/\text{SEC}$$

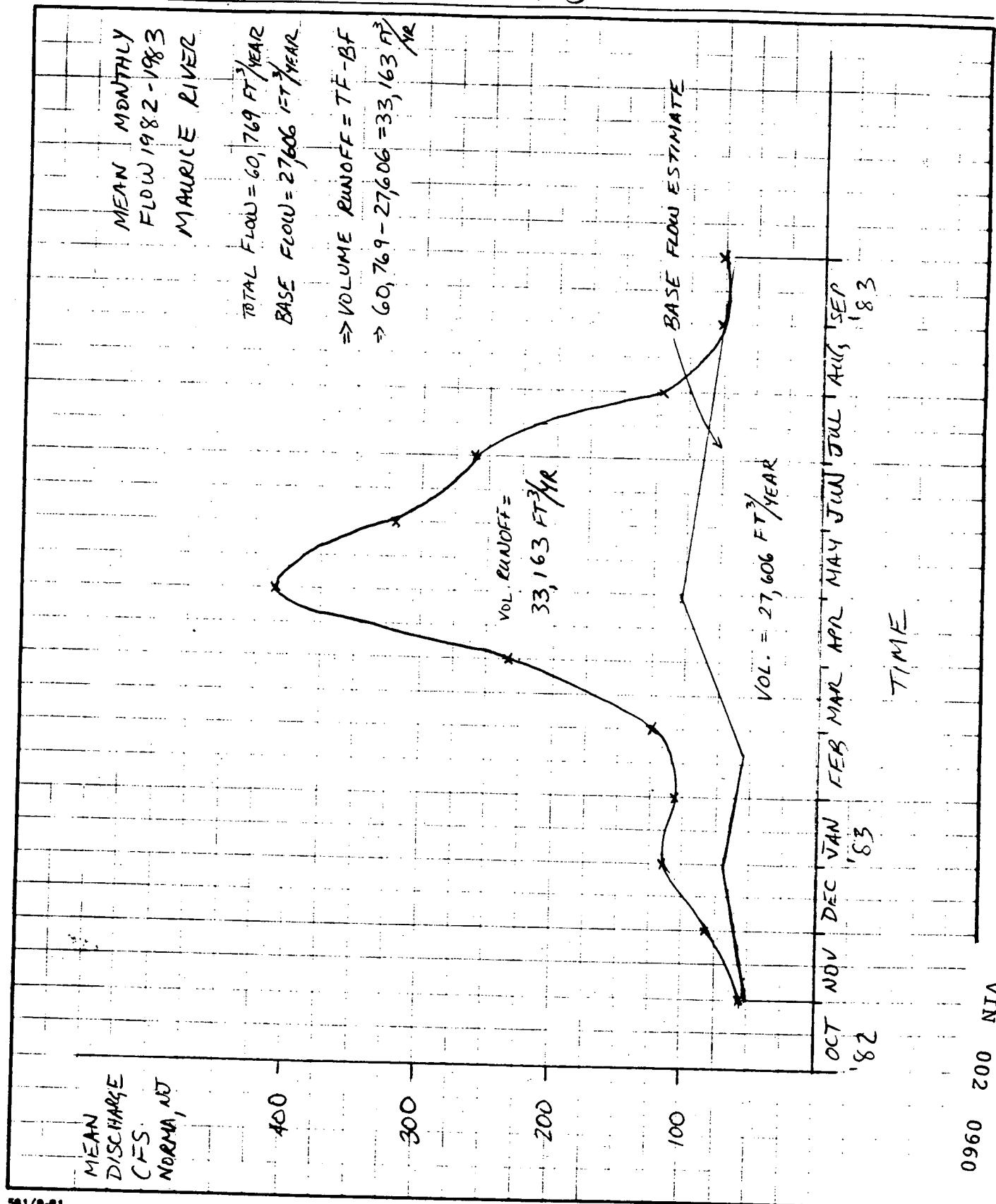
$$1/2 \text{ mi}^2$$

$$= 0.7 \text{ cfs/mi}^2$$

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 4/22/88

CHKD. BY _____ DATE _____

CLIENT USEPAPROJECT VINELAND CHEMICAL COMPANY
SUBJECT WATER BALANCE : 1982-1983SHEET 1 OF 1DEPT.
NO.

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 4/22/88SHEET OF
OFS NO. DEPT. NO. CHKD. BY DATE CLIENT USEPAPROJECT VINELAND CHEMICAL COMPANY SITESUBJECT WATER BUDGET: 1982-1983

MEAN TOTAL FLOW: 1982-1983

MONTH	AVERAGE DAILY FLOW (MAURICE R.)	X	# DAYS	= AVG MONTHLY FLOW
OCT '82	58.4	CFS	X 31	= 1810.4
NOV '82	86.9		X 30	= 2607
DEC '82	118		X 31	= 3658
JAN '83	107		X 31	= 3317
FEB '83	124		X 28	= 3472
MAR '83	234		X 31	= 7254
APR '83	412		X 30	= 12360
MAY '83	322		X 31	= 9982
JUN '83	263		X 30	= 7890
JUL '83	123		X 31	= 3813
AGS '83	757		X 31	= 2346.7
SEP '83	75.3	↓	X 30	= 2259
				MEAN TOTAL FLOW
				60,769.1 FT ³ /YEAR

$$\text{MEAN TOTAL FLOW PER YEAR (FT}^3\text{)} \times \text{YEAR} = \frac{\text{FT}^3}{\text{SEC}} = \text{MEAN TOTAL FLOW MAURICE RIVER}$$

$$\Rightarrow 60,769.1 \times \frac{1}{365} = 166.5 \text{ FT}^3/\text{SEC} = \text{MEAN TOTAL FLOW MAURICE RIVER}$$

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 4/22/88

CHKD. BY _____ DATE _____

CLIENT USEPASHEET 1 OF 1
OFS NO. 4236,313 DEPT. NO. 990PROJECT VINELAND CHEMICAL COMPANY SITESUBJECT WATER BUDGET: 1982 - 1983BASE FLOW: 1982 - 1983

MONTH	AVERAGE DAILY BASE FLOW (FROM PLOT)	X	DAYS	=	AVG. MONTHLY BASE FLOW
OCT '82	50 CFS	X	31	=	1550
NOV '82	60 CFS	X	30	=	1800
DEC '82	70 CFS	X	31	=	2170
JAN '83	62 CFS	X	31	=	1922
FEB '83	63 CFS	X	28	=	1764
MAR '83	85 CFS	X	31	=	2635
APR '83	103 CFS	X	30	=	3090
MAY '83	95 CFS	X	31	=	2945
JUN '83	89 CFS	X	30	=	2670
JUL '83	85 CFS	X	31	=	2635
AUG '83	75 CFS	X	31	=	2325
SEP '83	70 CFS	X	30	=	2100

$$\text{MEAN TOTAL BASEFLOW } 27,606 \text{ FT}^3/\text{YEAR}$$

$$\text{MEAN TOTAL BASEFLOW (FT}^3\text{) X } \frac{1 \text{ YEAR}}{365 \text{ DAYS}} = \frac{\text{FT}^3}{\text{SEC}} = \text{AVG. BASE FLOW MAURICE RIVER}$$

$$\Rightarrow 27,606 \times \frac{1}{365} = 75.6 \text{ FT}^3/\text{SEC} = \text{AVG. BASE FLOW MAURICE RIVER}$$

VIN 002 0962

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 9/22/83SHEET OF
OFS NO. DEPT. NO. CHKD. BY DATE CLIENT USEPAPROJECT VINELAND CHEMICAL COMPANY SITESUBJECT WATER BUDGET: 1982-1983

PRECIPITATION : MILLVILLE FAA AIRPORT STATION

MONTH	TOTAL PRECIPITATION
OCT '82	1.40 INCHES
NOV '82	4.68
DEC '82	2.67
JAN '83	2.03
FEB '83	3.19
MAR '83	6.99
APR '83	7.63
MAY '83	7.43
JUN '83	2.82
JUL '83	.74
AUG '83	1.73
SEPT '83	3.60

$$\text{TOTAL PPT.} = 40.91 \text{ inches}$$

$$\text{Basin Area} = 112 \text{ mi}^2$$

$$\text{RAINFALL (INCHES)} \times \frac{1 \text{ FT}}{12 \text{ IN.}} \times \text{Basin Area mi}^{-2} \times \frac{5280 \text{ FT}^2}{\text{mi.}^2} \Rightarrow \frac{\text{FT}^3 \text{ RAIN}}{\text{YEAR}}$$

$$\Rightarrow 40.91 \times \frac{1}{12} \times 112 \times 5280^2$$

$$= 1.04 \times 10^{10} \text{ FT}^3 \text{ RAIN / YEAR}$$

$$\frac{\text{FT}^3 \text{ RAIN}}{\text{YEAR}} \times \frac{1 \text{ YEAR}}{365 \text{ DAYS}} \times \frac{1 \text{ DAY}}{86,400 \text{ SEC}} = \frac{\text{FT}^3 \text{ RAIN}}{\text{SEC}}$$

$$= 1.04 \times 10^{10} \times \frac{1}{365} \times \frac{1}{86,400} = \underline{\underline{330 \text{ FT}^3 \text{ RAIN / SEC.}}}$$

VIN. 002 0963

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 7/5/88SHEET OF
DEPT. NO. CHKD. BY DATE OFS NO. CLIENT USEPAPROJECT VINELANDSUBJECT WATER BUDGET 1982-1983

$$\text{MEAN TOTAL FLOW} = 60,769 \text{ FT}^3/\text{YR}$$

$$= 166.5 \text{ FT}^3/\text{SEC} = 35.2 \text{ INCHES/YR}$$

$$\text{MEAN BASE FLOW} = 27,606 \text{ FT}^3/\text{YR}$$

$$= 75.6 \text{ FT}^3/\text{SEC} = 9.2 \text{ INCHES/YR}$$

RUNOFF

$$= \text{TOTAL FLOW} - \text{BASE FLOW}$$

$$= 60,769 - 27,606 \text{ FT}^3/\text{YR}$$

$$= 33,163 \text{ FT}^3/\text{YR}$$

$$= 90.9 \text{ FT}^3/\text{SEC} = 11.0 \text{ INCHES/YR}$$

RAINFALL

$$= 1.04 \times 10^{10} \text{ FT}^3/\text{YR}$$

$$= 330 \text{ FT}^3/\text{SEC} = 40.9 \text{ INCHES/YR}$$

EVAPOTRANSPIRATION

$$= \text{TOTAL RAINFALL} - \text{TOTAL FLOW}$$

$$= 330 \text{ FT}^3/\text{SEC} - 166.5 \text{ FT}^3/\text{SEC}$$

$$= 163.5 \text{ FT}^3/\text{SEC} = 20.7 \text{ INCHES/YR}$$

WATER BALANCE

$$\text{RAINFALL} = 40.9 \text{ INCHES/YR}$$

$$\text{BASEFLOW} = 9.2 \text{ INCHES/YR} = 22\%$$

$$\text{RUNOFF} = 11.0 \text{ INCHES/YR} = 27\%$$

$$\text{EVAPOTRANSPIRATION} = 20.7 \text{ INCHES/YR} = 51\%$$

BASE FLOW/UNIT AREA = BASE FLOWDRAINAGE BASIN AREA

$$= 75.6 \text{ FT}^3/\text{SEC}$$

$$1/2 \text{ mi}^2$$

$$= 0.675 \text{ cfs/mi}^2$$

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 4/29/88

CHKD. BY _____ DATE _____

CLIENT USEPA

SHEET 1 OF 1
DEPT. NO. 1

PROJECT VINELAND CHEMICAL COMPANY

SUBJECT WATER BALANCE : 1983 - 1984

MEAN MONTHLY
FLOW 1983-1984
MAURICE RIVER

$$\begin{aligned} \text{TOTAL FLOW} &= 8598 \text{ CFS} \quad 7 \text{ FT}^3/\text{sec} \\ \text{BASE FLOW} &= 46,584 \text{ FT}^3/\text{sec} \\ \text{VOLUME RUNOFF} &= \text{TF} - \text{BF} \\ \Rightarrow \text{Vol. Runoff} &= 39,403 \text{ FT}^3/\text{YEAR} \end{aligned}$$

$$\text{Vol. Runoff} = 39,403 \text{ FT}^3/\text{YEAR}$$

BASE FLOW ESTIMATE

$$\text{Vol.} = 46,584 \text{ FT}^3/\text{YEAR}$$

EA

TIME

OCT NOV DEC JAN FEB MAR APR MAY JUN JUE AUG SEP
83 84

MEAN
DISCHARGE,
CFS
Abema, NJ
Maurice River

400
300

200
100

965 002 001 VIA

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 9/24/88

CHKD. BY _____ DATE _____

CLIENT USEPASHEET OF OFS NO. DEPT. NO. PROJECT VINELAND CHEMICAL COMPANY SITE
SUBJECT WATER BUDGET: 1983-1984

MEAN TOTAL FLOW: 1983-1984

MONTH	AVERAGE DAILY FLOW (MAURICE R.)	X # DAYS = AVG. MONTHLY FLOW
OCT 83	95.7	CFS
NOV 83	173	x 31 = 2966.7
DEC 83	241	x 30 = 5190
JAN 84	199	x 31 = 7471
FEB 84	239	x 31 = 6169
MAR 84	350	x 28 = 6692
APR 84	487	x 31 = 10850
MAY 84	268	x 30 = 13110
JUN 84	259	x 31 = 8308
JUL 84	290	x 30 = 7770
AUG 84	160	x 31 = 8990
SEP 84	117	x 31 = 4960
		x 30 = 3510
		MEAN TOTAL FLOW 85986.7 ft ³ /YEAR

$$\text{MEAN TOTAL FLOW PER YEAR (ft}^3\text{)} \times \frac{1 \text{ YEAR}}{365 \text{ DAYS}} = \frac{\text{ft}^3}{\text{SEC}} = \text{MEAN TOTAL FLOW MAURICE RIVER}$$

$$\Rightarrow 85,987 \times \frac{1}{365} = 235.6 \text{ ft}^3/\text{sec} = \text{MEAN TOTAL FLOW MAURICE RIVER}$$

VIN 002 0966

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 4/24/88

CHKD. BY _____ DATE _____

CLIENT USEPASHEET OF
OFS NO. DEPT. NO. PROJECT VINELAND CHEMICAL COMPANY SITE
SUBJECT WATER BUDGET : 1983-1984

BASE FLOW: 1983-1984

MONTH	AVERAGE DAILY BASE FLOW (FROM PLOT)	X #DAYS	= AVERAGE MONTHLY BASE FLOW
OCT '83	96 CFS	X 31	= 2976
NOV '83	107 CFS	X 30	= 3210
DEC '83	118 CFS	X 31	= 3658
JAN '84	112 CFS	X 31	= 3472
FEB '84	128 CFS	X 28	= 3584
MAR '84	140 CFS	X 31	= 4340
APR '84	155 CFS	X 30	= 4650
MAY '84	150 CFS	X 31	= 4650
JUN '84	147 CFS	X 30	= 4410
JUL '84	139 CFS	X 31	= 4309
AUG '84	125 CFS	X 31	= 3875
SEP '84	115 CFS	X 30	= 3450

MEAN TOTAL
BASE FLOW 46,584,
FT³/YEARMEAN TOTAL
BASE FLOW
PER YEAR (FT³) X 1 YEAR = FT³ = AVG. BASE FLOW
MAURICE RIVER $\Rightarrow 46,584 \times \frac{1}{365} = 127.6 \text{ FT}^3/\text{SEC}$ = AVG. BASE FLOW
MAURICE RIVER

VIN 062 0967

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 9/22/88SHEET OF
DEPT. NO. CHKD. BY DATE OFS NO. CLIENT USEPAPROJECT VINELAND CHEMICAL COMPANY SITESUBJECT WATER BUDGET: 1983-1984

PRECIPITATION: MILLVILLE FAA AIRPORT STATION

MONTH	TOTAL PRECIPITATION	
OCT '83	3.48 INCHES	
NOV '83	7.11	
DEC '83	5.45	TOTAL PPT = 52.83 INCHES
JAN '84	2.13	BASIN AREA = 112 mi ²
FEB '84	5.17	
MAR '84	6.56	
APR '84	6.36	
MAY '84	6.25	
JUN '84	3.81	
JUL '84	3.89	
SEP '84	2.62	

$$\text{RAINFALL (IN.)} \times \frac{1 \text{ FT}}{12 \text{ IN.}} \times \text{BASIN AREA (mi}^2\text{)} \times \frac{5280^2 \text{ FT}^2}{\text{mi}^2} \Rightarrow \frac{\text{FT}^3 \text{ RAIN}}{\text{YEAR}}$$

$$\Rightarrow 52.83 \times \frac{1}{12} \times 112 \times 5280^2$$

$$= 1.37 \times 10^{10} \text{ FT}^3 \text{ RAIN/YEAR}$$

$$\frac{\text{FT}^3 \text{ RAIN}}{\text{YEAR}} \times \frac{1 \text{ YEAR}}{365 \text{ DAYS}} \times \frac{1 \text{ DAY}}{86,400 \text{ SEC}} = \frac{\text{FT}^3 \text{ RAIN}}{\text{SEC}}$$

$$= 1.37 \times 10^{10} \times \frac{1}{365} \times \frac{1}{86,400} = \underline{\underline{436 \text{ FT}^3 \text{ RAIN/SEC}}}$$

VIN 002 0968

EBASCO SERVICES INCORPORATED

BY P. ARNET DATE 5/7/88SHEET _____ OF _____
OFS NO. _____ DEPT. NO. _____

CHKD. BY _____ DATE _____

CLIENT USEPA

PROJECT VINELAND CHEMICAL COMPANY SITE

SUBJECT WATER BUDGET: 1983-1984

$$\text{MEAN TOTAL FLOW} = 85,987 \text{ FT}^3/\text{YR}$$

$$= 235.6 \text{ FT}^3/\text{SEC} = 50 \text{ INCHES/YR}$$

$$\text{MEAN BASE FLOW} = 46,584 \text{ FT}^3/\text{YR}$$

$$= 127.6 \text{ FT}^3/\text{SEC} = 15.4 \text{ INCHES/YR}$$

$$\text{RUNOFF} = \text{TOTAL FLOW} - \text{BASE FLOW}$$

$$= 85,987 - 46,584 \text{ FT}^3/\text{YR}$$

$$= 39,403 \text{ FT}^3/\text{YR}$$

$$= 108 \text{ FT}^3/\text{SEC} = 13.1 \text{ INCHES/YR}$$

$$\text{RAINFALL} = 1.37 \times 10^{10} \text{ FT}^3/\text{YR}$$

$$= 436 \text{ FT}^3/\text{SEC} = 52.8 \text{ INCHES/YR}$$

$$\text{EVAPOTRANSPIRATION} = \text{TOTAL RAINFALL} - \text{TOTAL FLOW}$$

$$= 1.37 \times 10^{10} \text{ FT}^3/\text{YR}$$

$$= 200.4 \text{ FT}^3/\text{SEC} = 24.3 \text{ INCHES/YR}$$

$$\text{WATER BALANCE}$$

RAINFALL	= 52.8	INCHES/YR	VIN 002 0969
BASE FLOW	= 15.4	INCHES/YR	
RUNOFF	= 13.1	INCHES/YR	
EVAPOTRANSPIRATION	= 24.3	INCHES/YR	

= 29 %

= 25 %

= 46 %

APPENDIX D

VIN 002 0970

APPENDIX D

STREAM FLOWRATE CALCULATIONS

8519b

VIN 002 0971

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/7/87

CHKD. BY PN DATE 12/15/88
1n 8/14/88

CLIENT _____

PROJECT _____

SUBJECT _____

SHEET OF

DEPT.
NO. _____

OFS NO. _____

Vineland Chemical Co.: RI/FS

(REM III / VINE EPA 4236-313)

Stream Flowrate Calculations

in the Maurice River Basin

Project Manager: William Colvin

Field Operations Leader: Ray A

Project Engineer: Maria Hart

VIN 002 0972

EBASCO SERVICES INCORPORATED

BY _____ DATE _____

SHEET _____ OF _____

CHKD. BY _____ DATE _____

OFS NO. _____ DEPT. NO. _____

CLIENT _____

PROJECT _____

SUBJECT _____

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VIN 002 0973

EBASCO SERVICES INCORPORATED

BY _____ DATE _____

SHEET 1 OF 17

CHKD. BY _____ DATE _____

OFS NO. _____ DEPT. NO. _____

CLIENT _____

PROJECT _____

SUBJECT _____

CRITERIA:Purpose of Calculations

These calculations were performed to estimate the mass flowrate of the contaminant in a stream at the time of sampling and to estimate the relative flowrates of various tributaries and the Maurice River. The first flowrate measurement at a sample location was taken during the sediment and surface water sampling events. Once the concentration of contaminant in the surface water is calculated through analysis, the mass flowrate of contaminant flowing downstream in the surface water can be calculated by multiplying the concentration by the total volumetric flow. The resultant mass flowrate can be used to determine the load factor of the stream.

The second flowrate measurements at the same sample locations were all performed within 24 hrs. Thus relative flowrates of all tributaries and streams in the Maurice River Basin. In some instances where sample locations are in close proximity, the change in flowrate from one station to the next can be used to approximate groundwater recharge or discharge.

Design Requirements:

The accuracy required for the original data and the resulting calculations is dependent on the type of remediation applied to the site. Chemical treatment would most likely require a higher degree of accuracy than other remedial actions. The type of remedial action chosen for the

VIN 002 0974

EBASCO SERVICES INCORPORATED

BY _____ DATE _____

SHEET 2 OF 17

CHKD. BY _____ DATE _____

OFS NO. _____ DEPT. NO. _____

CLIENT _____

PROJECT _____

SUBJECT _____

CRITERIA: (cont)**Design Requirements: (cont)**

Viveland Chemical Site is not known at the Remedial Investigation stage of the study, therefore data must be as accurate as feasible in order to be applicable to a majority of Remedial Technologies. Actual field data is preferred to engineering assumptions. In some cases, assumptions are unavoidable when considering physical and economic conditions.

ASSUMPTIONS:

It is assumed that the surface water sample taken from the middle of the stream is representative of all the water contained in that portion of the stream. Soluble concentrations of contaminant may vary from concentration adjacent to the stream bottom or the channel banks, however these differences are small and for all intensive purposes are negligible.

The second flowrate measurements are supposed to be taken simultaneously. Due to personnel restrictions only one field team was available. All measurement were taken in a 24 hour period. Stream flowrates do not vary substantial in one day in which no rainfall event occurs therefore it is assumed that these streams maintained a constant flowrate throughout the sampling day.

VIN
002
0975

BY _____ DATE _____

SHEET 3 OF 17

CHKD. BY _____ DATE _____

OFS NO. _____

DEPT. NO. _____

CLIENT _____

PROJECT _____

SUBJECT _____

CALCULATIONS

The stream flowrates were measured using a pygmy meter which measures the velocity of the water. Ten velocity measurement locations were chosen equidistantly across the stream perpendicular to the flow. At each velocity location, three velocity readings were taken and then averaged to increase accuracy. The stream cross-section was divided into ten sections of equal length in order to better approximate the fluviate since flowrate is different in some areas of the stream cross-section. Once the velocity is known in one of the ten subsections, it is multiplied by the area of the subsection (i.e. depth times width) which equals the volumetric flowrate of the stream in that particular subsection. After the volumetric flowrates are calculated for each subsection, they are added together to equal the total volumetric flowrate for the stream. An example calculation is shown below for Cross-Section ER-11 (Tartlin Branch) for the first measurement.

ER-11 Example

1st Subsection

$$\text{Eq #1} \quad W \times D = A$$

$$1.7 \times .5 = .8$$

where W = Width = 1.7 feet

D = Depth = .5 feet

A = Area = $.8 \text{ ft}^2$

$$\text{Eq #2} \quad A \times \text{Ave Vel} = Q_1$$

$$.8 \times 11.3 = 9.6 \text{ ft}^3/\text{m}$$

Ave Vel = Average Velocity = 11.3 ft/s

Q_1 = Volumetric Flowrate of subsection
($i = 1$)

Similar calculations for 2 thru 10 } Q_{TOT} = Total Volumetric Flowrate

entire stream

$$\text{Eq #3}$$

$$Q_1 + Q_2 + Q_3 + Q_4 + Q_5 + Q_6 + Q_7 + Q_8 + Q_9 + Q_{10} = Q_{TOT}$$

$$9.6 + 37.3 + 26.9 + 35.0 + 48.8 + 53.7 + 64.4 + 54.6 + 80.4 = 410.7 \text{ ft}^3/\text{s}$$

EBASCO SERVICES INCORPORATED

BY Mario Hartmann DATE 12/2/87SHEET 4 OF 17CHKD. BY TIG DATE 12/15/87OFS NO. _____ DEPT. NO. 940CLIENT EEA-REM II CONTRACTPROJECT Vineland Chemical Co.SUBJECT Stream Flowrate CalculationsNOTES:STREAM CROSS-SECTION ER-II (TARKLIN BRANCH)Date: 6/23/87 (1st Measurement)

Ave Vel = Average Velocity

Q = Volumetric Flowrate

Q_{TOT} = Total VolumetricFlowrate of
the Stream

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel. (ft/s)	Q (ft ³ /s)
1.7	.5	.8	11.3	9.6
2.0	.5	1.0	37.3	37.3
2.0	.4	.8	33.7	26.9
2.0	.3	.6	58.3	35.0
2.0	.4	.8	61.0	48.8
2.0	.5	1.0	53.7	53.7
2.0	.6	1.2	53.7	64.4
2.0	.7	1.4	39.0	54.6
2.0	.9	1.8	44.7	80.4

$$A_{TOT} = 9.4 \text{ ft}^2$$

$$Q_{TOT} = 410.7 \text{ ft}^3/\text{m}$$

$$A_p = 10.7 \text{ ft}^2$$

$$Q_{TOT} = 6.8 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-5 (BLACKWATER BRANCH)Date: 6/25/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel. (ft/s)	Q (ft ³ /s)
2.0	1.5	3.0	8.0	24.0
2.0	2.5	5.0	17.7	88.5
2.0	2.6	5.2	40.3	209.6
2.0	2.4	4.8	30.3	127.4 \leftarrow 145.4
2.0	2.5	5.0	32.0	160.0
2.0	2.8	5.6	36.3	203.4
2.0	3.0	6.0	19.0	114.0
2.0	2.5	5.0	8.7	43.3 \leftarrow 43.5
2.0	1.8	3.6	4.3	15.6
2.0	1.3	2.6	2.7	6.9

1010.9

VIN 002 0977

$$A_{TOT} = 45.6 \text{ ft}^2 \quad Q_{TOT} = 9.927 \text{ ft}^3/\text{s}$$

$$A_p = 45.0 \text{ ft}^2 \quad Q_{TOT} = 16.5 \text{ ft}^3/\text{s}$$

16.8

EBASCO SERVICES INCORPORATED

BY Maria Hartman DATE 12/2/87CHKD. BY TG DATE 12/15/87CLIENT EPA-REM III CONTRACTPROJECT Vineland Chemical Co.SUBJECT Stream Flowrate CalculationsSHEET 5 OF 17

OFS NO. _____

DEPT. NO. 940STREAM CROSS-SECTION ER-9D (MUDY RUN)Date: 6/30/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/s)	Q _i (ft ³ /s)
3.0	2.0	6.0	78.3	469.8
3.0	1.8	5.4	69.7	376.4
3.0	1.8	5.4	34.7	187.4
3.0	1.4	4.2	36.0	151.2
3.0	1.6	4.8	24.0	115.2
3.0	2.0	6.0	18.3	109.8
3.0	2.3	6.9	35.7	246.3
3.0	2.1	6.3	57.7	363.5
3.0	2.3	6.9	55.0	379.5
3.0	2.0	6.0	19.0	114.0

$$A_{\text{tot}} = 57.9 \text{ ft}^2$$

$$Q_{\text{tot}} = 2513.1 \text{ ft}^3/\text{s}$$

$$A_p = 54.3 \text{ ft}^2$$

$$Q_{\text{tot}} = 41.9 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-9 (LITTLE ROBIN BRANCH)Date: 7/1/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/s)	Q _i (ft ³ /s)
1.0	.2	.2	25.3	5.1
1.0	.3	.3	24.7	7.4
1.0	.15	.15	44.0	6.6
1.0	.15	.15	54.3	8.1
1.0	.15	.15	48.0	7.2
1.0	.15	.15	64.0	9.6
1.0	.2	.2	76.3	15.3
1.0	.2	.2	66.0	13.2
1.0	.3	.3	46.3	13.9
1.0	.2	.2	25.0	5.0

$$A_{\text{tot}} = 5.0 \text{ ft}^2$$

$$Q_{\text{tot}} = 91.4 \text{ ft}^3/\text{s} = 1.5 \text{ ft}^3/\text{s}$$

$$A_p = 2.3 \text{ ft}^2$$

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/2/87SHEET 6 OF 17CHKD. BY TIG DATE 12/15/87OFS NO. _____ DEPT. NO. 940CLIENT EPA-REM III CONTRACTPROJECT Vineland Chemical Co.SUBJECT Stream Flowrate CalculationsSTREAM CROSS-SECTION ER-10 (MAURICE RIVER)Date: 7/9/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft^2)	Ave. Vel (ft/s)	$Q_i (\text{ft}^3/\text{s})$
4.0	3.5	14.0	59.7	835.8
4.0	4.0	16.0	58.7	939.2
4.0	4.5	18.0	95.0	1710.0
4.0	5.0	20.0	101.3	2026.0
4.0	5.2	20.8	109.0	2267.2
4.0	5.2	20.8	110.7	2302.6
4.0	5.1	20.4	81.3	1658.5
4.0	4.8	19.2	76.3	1465.0
4.0	4.5	18.0	66.7	1200.6
4.0	3.8	15.2	53.3	810.2

$$A_p = 164.5 \text{ ft}^2 \quad A_{\text{tot}} = 182.4 \text{ ft}^2$$

$$Q_{\text{tot}} = 122338 \text{ ft}^3/\text{s} = 203.9 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-3A (BLACKWATER BRANCH) $15215.1 \text{ ft}^2 = 253.6 \text{ ft}^3/\text{scc}$

Date: 7/13/87

Width (ft)	Depth (ft)	Area (ft^2)	Ave. Vel (ft/s)	$Q_i (\text{ft}^3/\text{s})$
2.0	1.4	2.8	40.7	114.0
2.0	1.4	2.8	38.7	108.4
2.0	1.4	2.8	59.0	151.2
2.0	1.3	2.6	59.3	154.2
2.0	1.1	2.2	58.7	129.1
2.0	1.0	2.0	32.0	64.0
2.0	1.0	2.0	30.0	60.0
2.0	1.0	2.0	18.7	37.40
2.0	.7	1.4	18.7	26.2
2.0	.7	1.4	24.0	33.6

$$A_{\text{tot}} = 22.0 \text{ ft}^2$$

$$Q_{\text{tot}} = 878.1 \text{ ft}^3/\text{s}$$

$$A_p = 23.7 \text{ ft}^2$$

$$Q_{\text{tot}} = 14.6 \text{ ft}^3/\text{s}$$

VIN 002 0979

EBASCO SERVICES INCORPORATED

BY M. Morrissey DATE 12/2/87CHKD. BY TIG DATE 12/5/87CLIENT EPA RE: E STREAMPROJECT Vineland Chemical Co.SUBJECT Stream Flowrate CalculationsSHEET 7 OF 17OFS NO. _____ DEPT. NO. 140STREAM CROSS SECTION ER-4 (BLACKWATER BRANCH)Date 7/13/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave.W (ft)	Q _i (ft ³ /s)	
2.0	3.0	6.0	24.7	148.0	148.2
2.0	3.5	7.0	22.0	154.0	
2.0	4.0	8.0	15.3	172.6	122.4
2.0	4.0	8.0	32.0	256.0	
2.0	4.0	8.0	40.0	320.0	
2.0	4.0	8.0	41.0	328.0	
2.0	4.0	8.0	35.7	285.3	285.6
2.0	3.5	7.0	27.7	193.6	193.9
2.0	2.0	4.0	18.7	74.6	74.8
2.0	1.0	2.0	29.3	58.7	

$$A_{tot} = 66.0 \text{ ft}^2$$

$$A_p = 66.7 \text{ ft}^2$$

$$Q_i = 1940.8 \text{ ft}^3/\text{s}$$

$$Q_{tot} = 32.3 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-0 (BLACKWATER BRANCH)Date 7/14/87 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave.Vol (ft ³ /m)	Q _i (ft ³ /m)
2.0	2.0	4.0	9.3	37.3
2.0	2.0	4.0	21.0	84.0
2.0	1.8	3.6	49.0	176.4
2.0	1.8	3.6	75.7	272.4
2.0	1.5	3.0	73.3	270.0
2.0	1.5	3.0	38.7	116.0
2.0	1.3	2.6	25.7	66.7
2.0	1.6	3.2	15.3	49.1
2.0	1.1	2.2	11.0	24.2
2.0	1.0	2.0	8.3	16.7

$$A_{tot} = 31.2 \text{ ft}^2$$

$$A_p = 30.7$$

$$Q_i = 1062.7 \text{ ft}^3/\text{s}$$

$$Q_{tot} = 17.7 \text{ ft}^3/\text{s}$$

VIN 002 0980

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/3/87CHKD. BY TIG DATE 12/15/87SHEET 8 OF 17OFS NO. _____ DEPT. NO. 940CLIENT EPA-REM III CONTRACTPROJECT Vineland Chemical CoSUBJECT Stream Flowrate CalculationsSTREAM CROSS-SECTION ER-0ADate: 7/15/87 (1st Measurements)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/m)	Q _i (ft ³ /m)
1.0	1.8	1.8	78.7	141.6
1.0	1.8	1.8	112.0	201.6
1.0	1.8	1.8	88.7	159.6
1.0	1.7	1.7	112.7	191.5
1.0	1.7	1.7	83.7	142.2
1.0	1.7	1.7	109.7	186.4
1.0	1.5	1.5	107.7	161.5
1.0	1.4	1.4	81.0	144.2
1.0	1.1	1.1	45.0	49.5
1.0	1.1	1.1	29.0	31.9

$$A_{tot} = 15.6 \text{ ft}^2 \quad Q_{tot} = 1380.1 \text{ ft}^3/\text{m} \quad 1379.2 \text{ ft}^3/\text{m}$$

$$A_p = 15.2 \text{ ft}^2 \quad Q_{tot} = 23.0 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-7 (Maurice River)Date: 7/15/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/m)	Q _i (ft ³ /m)
4.5	2.0	9.0	59.0	531.0
4.5	2.5	11.2	49.0	548.8
4.5	3.5	15.7	99.8	1566.9
4.5	4.0	18.0	109.2	1965.6
4.5	4.5	20.2	113.0	2282.6
4.5	4.5	20.2	122.3	2470.5
4.5	4.0	18.0	138.3	2489.4
4.5	2.0	9.0	149.0	1341.0
4.5	2.0	9.0	106.7	960.3
4.5	2.0	9.0	73.3	659.7

$$A_{tot} = 139.3 \text{ ft}^2$$

$$A_p = 148.8 \text{ ft}^2$$

$$Q_{tot} = 14815.8 \text{ ft}^3/\text{m}$$

$$Q_{tot} = 246.9 \text{ ft}^3/\text{s}$$

VIN 002 0981

EBASCO SERVICES INCORPORATED

BY Mari Hartmann DATE 12/3/87CHKD. BY JTG DATE 12/15/87CLIENT EPA-REM III CONTRACTPROJECT Vineland Chemical Co.SUBJECT Stream Flowrate CalculationsSHEET 9 OF 17

OFS NO. _____

DEPT. NO. 941STREAM CROSS-SECTION ER-6A (Maurice River)Date: 7/16/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/s)	Q _i (ft ³ /s)
3.5	4.5	15.7	9.7	152.3
3.5	5.0	17.5	81.5	1426.2
3.5	5.5	19.2	97.5	1872.0
3.5	5.5	19.3	102.8	1984.0
3.5	5.5	19.2	108.7	2087.0
3.5	5.5	19.3	80.7	1557.5
3.5	5.5	19.2	73.7	1415.0
3.5	5.0	17.5	49.7	869.7
3.5	5.0	17.5	8.0	140.0
3.5	4.0	14.0	6.2	86.8

$$A_{tot} = 178.4$$

$$F_f = 173.4$$

$$Q_{tot} = 11,590.5 \text{ ft}^3/\text{s}$$

$$Q_{tot} = 193.2 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-12CDate: 7/16/87 (1st Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/s)	Q _i (ft ³ /s)
1.4	.6	.9.8	23.7	21.5
1.4	.8	1.1	39.7	44.4
1.4	1.0	1.4	57.7	80.7
1.4	1.2	1.7	56.3	94.6
1.4	1.4	2.0	31.0	60.8
1.4	1.5	2.1	41.0	86.1
1.4	1.5	2.1	33.3	70.0
1.4	1.6	2.2	21.0	47.0
1.4	1.5	2.1	21.7	45.5
1.4	1.4	2.0	19.0	37.2

$$A_{tot} = 17.5$$

$$A_P = 16.8$$

$$Q_{tot} = 587.9 \text{ ft}^3/\text{s}$$

$$Q_{tot} = 9.8 \text{ ft}^3/\text{s}$$

VIN 002 0982

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/3/87CHKD. BY TTC DATE 12/15/87CLIENT EPA - REM III ContractPROJECT Vineland Chemical Co.SUBJECT Stream Flowrate CalculationsSHEET 10 OF 12DEPT.
NO.

OFS NO.

STREAM CROSS-SECTION ER-0ADate: 7/30/87 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/s)	Q _L (ft ³ /s)
1.2	.8	1.0	24.0	24.0
1.2	.8	1.0	28.0	28.0
1.2	.8	1.0	48.0	48.0
1.2	.8	1.0	44.0	44.0
1.2	.7	.8	36.0	29.8
1.2	.7	.8	32.0	25.6
1.2	.7	.8	28.0	22.4
1.2	.7	.8	24.0	19.2
1.2	.6	.7	20.0	14.0
1.2	.4	.5	15.0	7.5

$$A_{\text{tot}} = 8.4$$

$$Q_{\text{tot}} = 261.5 \text{ ft}^3/\text{s}$$

$$Q_{\text{av}} = 4.4 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION FR-0Date: 7/30/82 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/s)	Q _L (ft ³ /s)
1.9	.8	1.5	15.0	22.5
1.9	.9	1.7	20.0	34.0
1.9	1.0	1.9	56.0	106.4
1.9	1.0	1.9	32.0	60.8
1.9	1.0	1.9	41.0	77.9
1.9	.9	1.7	37.0	62.9
1.9	1.0	1.9	46.0	87.4
1.9	1.3	2.5	30.0	75.0
1.9	1.0	1.9	17.0	32.3
1.9	1.0	1.9	14.0	26.6

$$A_{\text{tot}} = 18.8$$

$$Q_{\text{tot}} = 585.8 \text{ ft}^3/\text{s}$$

$$Q_{\text{av}} = 9.8 \text{ ft}^3/\text{s}$$

VIN 002 0983

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/3/87CHKD. BY TG DATE 12/10/87CLIENT EPA - REM III ContractPROJECT Vineland Chemical Co.SUBJECT Stream Flowrate CalculationsSHEET 11 OF 17DEPT.
NO.

OFS NO.

STREAM CROSS-SECTION ER-4 (BLACKWATER BRANCH)Date: 7/30/87 (2nd Measurement)

From Field
Boat Sta.
10 readings
20' wide
26' long
R2/1/88

	Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/m)	Q _i (ft ³ /m)	
	2.06	2.4	4.8	3.0	14.4	18.7
	2.06	2.4	4.8	3.0	14.4	18.7
	2.06	2.6	5.2	7.0	36.4	47.3
	2.76	2.6	5.2	9.0	46.8	60.8
	2.76	3.0	6.0	14.0	84.0	109.2
	2.76	3.0	6.0	17.0	102.0	132.6
	2.76	3.0	6.0	16.0	96.0	124.8
	2.76	3.0	6.0	14.0	84.0	109.2
	2.76	1.7	3.4	8.0	27.2	35.4
	2.76	1.1	2.2	2.0	4.4	5.7

$$A_{TOT} = 49.6$$

~~$$Q_{TOT} = \frac{505.6 \text{ ft}^3}{\text{sec}} = 8.4 \text{ ft}^3/\text{sec}$$~~

STREAM CROSS-SECTION ER-9 (Little Robin Branch)Date: 7/30/87 (2nd Measurement)

11.1 CAS
RN
8/1/88

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/m)	Q _i (ft ³ /m)
1.0	.3	.3	48.0	14.4
1.0	.3	.3	48.0	14.4
1.0	.3	.3	52.0	17.1
1.0	.4	.4	66.0	26.4
1.0	.3	.3	44.0	13.2
1.0	.2	.2	39.0	7.8
1.0	.2	.2	31.0	6.2
1.0	.2	.2	24.0	4.8
1.0	.3	.3	26.0	7.8
1.0	.3	.3	47.0	14.1

$$A_{TOT} = 2.8$$

$$Q_{TOT} = 126.2 \text{ ft}^3/\text{sec}$$

$$\boxed{Q_{TOT} = 2.1 \text{ ft}^3/\text{s}}$$

EBASCO SERVICES INCORPORATED

BY Maria Hartman DATE 12/3/87CHKD. BY TG DATE 12/15/87CLIENT EPA - REM III ContractPROJECT Vineland Chemical CoSUBJECT Stream Flowrate CalculationsSHEET 12 OF 17

OFS NO.

DEPT.
NO. 940STREAM CROSS-SECTION ER-7 (Maurice River)Date: 7/30/87 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave Vel (ft/s)	Q _u (ft ³ /s)
4.5	1.4	6.3	31.0	195.3
4.5	1.5	6.7	32.0	214.4
4.5	1.7	7.6	42.0	39.2
4.5	2.1	9.4	66.0	620.4
4.5	3.0	13.5	60.0	810.0
4.5	3.1	13.9	57.0	792.3
4.5	3.1	13.9	63.0	875.7
4.5	2.9	13.0	52.0	676.0
4.5	2.1	9.4	30.0	282.0
4.5	2.0	9.0	38.0	342.0

$$A_{TOT} = 102.7$$

$$Q_{TOT} = 5127.3 \text{ ft}^3/\text{s}$$

$$Q_{TOT} = 85.45 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-6 (Maurice River)Date: 7/30/87 (2nd measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave Vel (ft/s)	Q _u (ft ³ /s)
3.5	1.0	3.5	9.0	31.5
3.5	1.2	4.2	36.0	151.2
3.5	1.9	6.6	50.0	330.0
3.5	2.0	7.0	47.0	329.0
3.5	2.5	8.7	48.0	426.3
3.5	2.8	9.8	46.0	450.8
3.5	3.0	10.5	45.0	451.5
3.5	3.1	10.8	54.0	583.2
3.5	3.3	11.5	48.0	552.0
3.5	3.5	12.2	46.0	561.2

$$A_{TOT} = 84.8$$

~~$$Q_{TOT} = 4283.9 \text{ ft}^3/\text{s}$$~~
$$Q_{TOT} = 386$$

$$Q_{TOT} = 77.5 \text{ ft}^3/\text{s}$$

$$Q_{TOT} = 64.4 \text{ ft}^3/\text{s}$$

VIN 002 0985

EBASCO SERVICES INCORPORATED

BY Mark Hartman DATE 12/3/87CHKD. BY TG DATE 12/15/87CLIENT EPA - REMITT ContractPROJECT Vineland Chemical Co.SUBJECT Stream Flow CalculationsSHEET 13 OF 17

OFS NO. _____

DEPT. NO. 470STREAM CROSS-SECTION ER-5 (BLACKWATER BRANCH)Date: 7/30/87 (2nd Measurement)

<u>Width (ft)</u>	<u>Depth (ft)</u>	<u>Area (ft²)</u>	<u>Ave Vel (ft/m)</u>	<u>Q_i (ft³/m)</u>	<u>Q_{Tot} (ft³/m)</u>
2.0	1.61.5	2.0	9.811	18.0	33
2.0	1.72.0	2.4	35013	86.4	52
2.0	1.92.5	3.8	52041	190.0	205
2.0	2.02.7	4.0	47057	186.0	308
2.0	3.52.6	5.0	49043	245.0	224
2.0	3.82.0	5.6	46021	257.6	84
2.0	3.01.8	6.0	43020	288.0	72
2.0	3.71.4	6.2	54017	339.8	48
2.0	3.31.0	6.6	45013	316.8	26
2.0	3.50.5	7.0	4604	320.0	4

$$A_{\text{tot}} = 48.6$$

$$Q_{\text{tot}} = 2216.6 \text{ ft}^3/\text{m} 1056$$

$$Q_{\text{tot}} = 36.77 \text{ ft}^3/\text{s} 17.6$$

7/30/88STREAM CROSS-SECTION ER-12 (MILL CREEK)Date: 7/30/87 (2nd Measurement)

<u>Width (ft)</u>	<u>Depth (ft)</u>	<u>Area (ft²)</u>	<u>Ave Vel (ft/m)</u>	<u>Q_i (ft³/m)</u>
1.4	.5	.7	20.0	14.0
1.4	.8	1.1	42.0	46.2
1.4	1.0	1.4	51.0	71.4
1.4	1.1	1.5	49.0	73.5
1.4	1.2	1.7	65.0	110.5
1.4	1.3	1.8	50.0	90.0
1.4	1.4	2.0	29.0	58.0
1.4	1.4	2.0	26.0	52.0
1.4	1.4	2.0	21.0	42.0
1.4	1.1	1.5	12.0	18.0

$$A_{\text{tot}} = 15.7$$

$$Q_{\text{tot}} = 575.6 \text{ ft}^3/\text{m}$$

$$Q_{\text{tot}} = 9.6 \text{ ft}^3/\text{s}$$

VIN 002 0986

EBASCO SERVICES INCORPORATED

BY Maria Hart DATE 12/3/87CHKD. BY JTG DATE 7/15/87CLIENT EPA - REM III ContractPROJECT Vineland Chemical Co.SUBJECT Stream Flow CalculationsSHEET 14 OF 17DEPT.
NO. 940

OFS NO. _____

STREAM CROSS-SECTION ER-13(Date: 7/30/87 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave Vel. (ft/m)	Q _i (ft ³ /m)
4.8	1.6	7.7	21.0	161.7
4.8	2.0	9.6	80.0	768.0
4.8	2.1	10.1	93.0	939.3
4.8	2.2	10.6	114.0	1208.4
4.8	2.4	11.5	116.0	1334.0
4.8	2.1	10.1	114.0	1151.4
4.8	2.1	10.1	91.0	919.1
4.8	2.2	10.6	87.0	922.2
4.8	2.1	10.1	78.0	787.8
4.8	1.0	4.8	39.0	187.2

$$A_{TOT} = 95.2$$

$$Q_{TOT} = 8379.1 \text{ ft}^3/\text{m}$$

$$Q_{TOT} = 139.6 \text{ ft}^3/\text{s}$$

STREAM CROSS-SECTION ER-OCDate: 7/30/87 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel (ft/m)	Q _i (ft ³ /m)
.7	.1	.1	9.0	.9
.7	.2	.1	13.0	1.3
.7	.4	.3	27.0	8.1
.7	.5	.35	48.0	14.4
.7	.5	.4	47.0	18.8
.7	.6	.4	57.0	22.8
.7	.7	.5	58.0	29.0
.7	.7	.5	44.0	22.0
.7	.6	.4	31.0	12.4
.7	.6	.4	20.0	8.0

$$A_{TOT} = 3.5$$

$$Q_{TOT} = 127.7 \text{ ft}^3/\text{m}$$

$$Q_{TOT} = 3.3 \text{ ft}^3/\text{s}$$

VIN 002 0987

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/3/87CHKD. BY JTG DATE 12/15/87CLIENT EPA - REM III ContractPROJECT Vineland Chemical Co.SUBJECT Stream Flow CalculationsSHEET 15 OF 17

OFS NO. _____

DEPT.
NO. 940STREAM CROSS-SECTION ER-9D (Muddy Run)Date: 7/30/87 (2nd Measurement)

All 2 feet from field markings

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel. (ft/s)	Q _i (ft ³ /s)	
3.02	1.8	5.4	56.0	302.4	201.6
3.02	1.7	5.1	56.0	285.6	190.4
3.02	1.7	5.1	48.0	244.8	163.2
3.02	1.6	4.8	24.0	115.2	76.8
3.02	1.3	3.9	24.0	93.6	62.4
3.02	1.4	4.2	18.0	78.6	50.4
3.02	1.7	5.1	30.0	153.0	102
3.02	1.8	5.4	56.0	302.4	201.6
3.02	2.0	6.0	48.0	288.0	192
3.02	1.9	5.7	48.0	273.6	182.4

$$A_{TOT} = 50.7$$

$$Q_{TOT} = 2134.2 \text{ ft}^3/\text{s} 1422.8$$

$$Q_{TOT} = 356 \text{ ft}^3/\text{s} 23.7$$

STREAM CROSS SECTION ER-10 (Maurice River)Date: 7/30/87 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel. (ft/s)	Q _i (ft ³ /s)
4.0	3.0	12.0	20.0	240.0
4.0	3.5	14.0	48.0	672.0
4.0	4.0	16.0	80.0	1280.0
4.0	4.2	16.8	89.0	1344.0
4.0	4.6	18.4	88.0	1619.2
4.0	4.6	18.4	84.0	1545.6
4.0	4.5	18.0	88.0	1584.0
4.0	4.2	16.8	60.0	1008.0
4.0	3.5	14.0	64.0	896.0
4.0	3.5	14.0	48.0	672.0

$$A_{TOT} = 158.4$$

$$Q_{TOT} = 10860.8 \text{ ft}^3/\text{s}$$

$$Q_{TOT} = 181.0 \text{ ft}^3/\text{s}$$

VIN 002 0988

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/3/87CHKD. BY AN DATE 8/14/88CLIENT EPA REM III ContractPROJECT Vineland Chemical Co.SUBJECT Stream Flow CalculationsSHEET 16 OF 17OFS NO. _____ DEPT. NO. 940STREAM CROSS-SECTION ER-II (TARKLIN BRANCH)Date: 7/30/87 (2nd Measurement)

Width (ft)	Depth (ft)	Area (ft ²)	Ave. Vel. (ft/min)	Q _n (ft ³ /min)
1.6	.6	1.0	36.0	36.0
1.6	.6	1.0	36.0	36.0
1.6	.6	1.0	32.0	32.0
1.6	.5	.8	32.0	25.6
1.6	.5	.8	48.0	38.4
1.6	.5	.8	48.0	38.4
1.6	.6	1.0	52.0	52.0
1.6	.6	1.0	60.0	60.0
1.6	.7	1.1	56.0	61.6
1.6	.7	1.1	32.0	35.2

$$A_{\text{Tot}} = 9.6$$

$$Q_{\text{Tot}} = 415.2 \text{ ft}^3/\text{m}$$

$$\boxed{Q_{\text{Tot}} = 6.9 \text{ ft}^3/\text{s}}$$

VIN
002 0989

EBASCO SERVICES INCORPORATED

BY Maria Hartmann DATE 12/3/87SHEET 17 OF 17CHKD. BY _____ DATE 12/17/87

OFS NO. _____

DEPT.
NO. _____CLIENT EPA - REM III ContractPROJECT Vineland Chemical Co.SUBJECT Stream Flow CalculationsSUMMARY TABLES1st Measurements: Random Days for Loading Factors

STREAM NAME	LOCATION	Q(GF ³ /S)
Blackwater Branch	ER-0A†	23.0
Blackwater Branch	ER-0	17.7
Blackwater Branch	ER-3A	14.6
Blackwater Branch	ER-4	32.3
Blackwater Branch	ER-5	16.5-16.8
Maurice River	ER-6A	193.2
Maurice River	ER-7	246.9
Little Robins Branch	ER-9	1.5
Muddy Run	ER-9D	41.9
Tarklin Branch	ER-11	6.8
Maurice River	ER-10	203.7
Mill Creek	ER-12	9.8
		253.6

2nd Measurements: On One Day for Comparison

STREAM NAME	LOCATION	Q(GF ³ /S)
Blackwater Branch	ER-0A	4.4
Blackwater Branch	ER-0C	2.5-2.4
Blackwater Branch	ER-0	9.8
Blackwater Branch	ER-4	8.5
Blackwater Branch	ER-5	36.9 17.6
Maurice River	ER-6	-71.5 68.4
Maurice River	ER-7	85.4
Little Robins Branch	ER-9	2.1
Muddy Run	ER-9D	28.6 23.7
Tarklin Branch	ER-11	6.9
Maurice River	ER-10	181.0
Mill Creek	ER-12	9.6
Maurice River	ER-13	139.6

VIN 002 0990

APPENDIX E

VIN 002 0991

APPENDIX E

RISK ASSESSMENT CALCULATIONS
FOR ARSENIC

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VIN 002 0992

APPENDIX E
RISK ASSESSMENT CALCULATIONS
FOR ARSENIC

TABLE E-1

INGESTION OF STREAM SEDIMENT

=====

BOTTOM SEDIMENT BLACKWATER BRANCH WORST CAST, MAXIMUM ARSENIC SEDIMENT CONCENTRATION=3760 mg/kg

$$CDI = SC * IRS * SF * Fi * YRS / 70 / 1000 / BW$$

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	4.00E+01	1.10E-01	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	4.00E+01	1.10E-01	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	8.00E+01	2.19E-01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	8.00E+01	2.19E-01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	8.00E+01	2.19E 01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	8.00E+01	2.19E-01	5.97E+01	1.00E+00
		7.00E+01			

POPULATION	CDI MG/KG/DAY	IRS G/DAY	SC MG/KG	RISK
ADULT 18-70	2.19E-04	5.00E-02	3.76E+03	3.28E-04
INFANT 0-2	1.32E-04	1.00E-02	3.76E+03	1.97E-04
YOUNG CHILD 2-6	6.93E-04	2.00E-01	3.76E+03	1.04E-03
CHILD 6-10	2.07E-04	1.00E-01	3.76E+03	3.11E-04
CHILD 11-14	3.90E-05	5.00E-02	3.76E+03	5.85E-05
CHILD 15-18	2.96E-05	5.00E-02	3.76E+03	4.44E-05
STAGED LIFETIME MODEL	1.32E-03			1.98E-03
RISK	SC (mg/kg)	RISK	SC (mg/kg)	
1.00E-6	1.9	1.00E-5	19	

TABLE E-2

INGESTION OF STREAM SEDIMENT

=====

BOTTOM SEDIMENT

UPPER MAURICE RIVER WORST CASE, MAXIMUM ARSENIC SEDIMENT CONCENTRATION =
922 mg/kg

$$CDI = SC * IRS * SF * Fi * YRS / 70 / 1000 / BW$$

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	4.00E+01	1.10E-01	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	4.00E+01	1.10E-01	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	8.00E+01	2.19E-01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	8.00E+01	2.19E-01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	8.00E+01	2.19E-01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	8.00E+01	2.19E-01	5.97E+01	1.00E+00
		7.00E+01			

POPULATION	CDI MG/KG/DAY	IRS G/DAY	SC MG/KG	RISK
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ADULT 18-70	5.36E-05	5.00E-02	9.22E+02	8.04E-05
INFANT 0-2	3.23E-05	1.00E-01	9.22E+02	4.84E-05
YOUNG CHILD 2-6	1.70E-04	2.00E-01	9.22E+02	2.55E-04
CHILD 6-10	5.08E-05	1.00E-01	9.22E+02	7.62E-05
CHILD 11-14	9.56E-06	5.00E-02	9.22E+02	1.43E-05
CHILD 15-18	7.25E-06	5.00E-02	9.22E+02	1.09E-05

STAGED LIFETIME MODEL	3.23E-04	4.85E-04
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RISK	SC (mg/kg)	RISK	SC (mg/kg)
1.00E-6	1.9	1.00E-5	19

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TABLE E-3

INGESTION OF STREAM SEDIMENT

=====

BOTTOM SEDIMENT

BLACKWATER BRANCH, MOST PROBABLE CASE, MEDIAN ARSENIC SC = 229 mg/kg

CDI=SC*IRS*SF*Fi*YRS/70/1000/BW

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	7.00E+01	1.92E-02	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	7.00E+01	1.92E-02	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	4.00E+01	1.10E-01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	4.00E+01	1.10E-01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	4.00E+01	1.10E-01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	4.00E+01	1.10E-01	5.97E+01	1.00E+00
	7.00E+01				

POPULATION	CDI MG/KG/DAY	IRS G/DAY	SC MG/KG	RISK
ADULT 18-70	4.66E-07	1.00E-02	2.29E+02	6.99E-07
INFANT 0-2	7.01E-07	5.00E-02	2.29E+02	1.05E-06
YOUNG CHILD 2-6	8.44E-06	8.00E-02	2.29E+02	1.27E-05
CHILD 6-10	3.16E-06	5.00E-02	2.29E+02	4.73E-06
CHILD 11-14	2.37E-07	1.00E-02	2.29E+02	3.56E-07
CHILD 15-18	1.80E-07	1.00E-02	2.29E+02	2.70E-07
STAGED LIFETIME MODEL	1.32E-05			1.98E-05

RISK	SC (mg/kg)	RISK	SC (mg/kg)
1.00E-6	11.6	1.00E-5	116

TABLE E-4

INGESTION OF STREAM SEDIMENT

=====
BOTTOM SEDIMENTUPPER MAURICE RIVER MOST PROBABLE CASE, MEDIAN ARSENIC SEDIMENT CONCENTRATION:
70.8 mg/kg

CDI=SC*IRS*SF*Fi*YRS/70/1000/BW

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	7.00E+00	1.92E-02	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	7.00E+00	1.92E-02	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	4.00E+01	1.10E-01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	4.00E+01	1.10E-01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	4.00E+01	1.10E-01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	4.00E+01	1.10E-01	5.97E+01	1.00E+00
		7.00E+01			

POPULATION	CDI MG/KG/DAY	IRS G/DAY	SC MG/KG	RISK
ADULT 18-70	1.44E-07	1.00E-02	7.08E+01	2.16E-07
INFANT 0-2	2.17E-07	5.00E-02	7.08E+01	3.25E-07
YOUNG CHILD 2-6	2.61E-06	8.00E-02	7.08E+01	3.91E-06
CHILD 6-10	9.78E-07	5.00E-02	7.08E+01	1.46E-06
CHILD 11-14	7.34E-08	1.00E-02	7.08E+01	1.10E-07
CHILD 15-18	5.57E-08	1.00E-02	7.08E+01	8.35E-08
STAGED LIFETIME MODEL	4.07E-06			6.11E-06
RISK	SC (mg/kg)	RISK	SC (mg/kg)	
1.00E-6	11.6	1.00E-5	116	

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TABLE E-5

INGESTION OF STREAM WATER

=====

BLACKWATER BRANCH WORST CASE, MAXIMUM ARSENIC WC = 6200 ug/l
 = 6.2 mg/l

$$CDI = WC \cdot WI \cdot Fi \cdot SF \cdot YRS / 70 \cdot BW$$

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	4.00E+01	1.10E-01	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	4.00E+01	1.10E-01	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	8.00E+01	2.19E-01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	8.00E+01	2.19E-01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	8.00E+01	2.19E-01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	8.00E+01	2.19E-01	5.97E+01	1.00E+00
		7.00E+01			

POPULATION	CDI MG/KG/DAY	WC MG/L	WI L/DAY	RISK
ADULT 18-70	7.21E-04	6.20E+00	1.00E-01	1.08E-03
INFANT 0-2	2.17E-04	6.20E+00	1.00E-01	3.25E-04
YOUNG CHILD 2-6	5.71E-04	6.20E+00	1.00E-01	8.56E-04
CHILD 6-10	3.42E-04	6.20E+00	1.00E-01	5.13E-04
CHILD 11-14	1.29E-04	6.20E+00	1.00E-01	1.93E-04
CHILD 15-18	9.76E-05	6.20E+00	1.00E-01	1.46E-04
STAGED LIFETIME MODEL	2.08E-03			3.12E-03

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VIN 002 0997

TABLE E-6

INGESTION OF STREAM WATER

=====

B. UPPER MAURICE RIVER WORST CASE, MAXIMUM ARSENIC WC = 150 ug/l
 = 0.15 mg/l

$$CDI = WC * WI * Fi * SF * YRS / 70 / BW$$

POPULATION	RANGE OF YEARS	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	4.00E+01	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	4.00E+01	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	8.00E+01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	8.00E+01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	8.00E+01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	8.00E+01	5.97E+01	1.00E+00
		7.00E+01		

POPULATION	CDI MG/KG/DAY	WC MG/L	WI L/DAY	RISK
ADULT 18-70	1.74E-05	1.50E-01	1.00E-01	2.62E-05
INFANT 0-2	5.25E-06	1.50E-01	1.00E-01	7.87E-06
YOUNG CHILD 2-6	1.38E-05	1.50E-01	1.00E-01	2.07E-05
CHILD 6-10	8.27E-06	1.50E-01	1.00E-01	1.24E-05
CHILD 11-14	3.11E-06	1.50E-01	1.00E-01	4.67E-06
CHILD 15-18	2.36E-06	1.50E-01	1.00E-01	3.54E-06
STAGED LIFETIME MODEL	5.02E-05			7.54E-05

TABLE E-7

INGESTION OF STREAM WATER

BLACKWATER BRANCH MOST PROBABLE CASE, MEDIAN ARSENIC WC: 0.36 MG/L

$$CDI = WC \cdot WI \cdot Fi \cdot SF \cdot YRS / 70 \cdot BW$$

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	7.00E+00	1.92E-02	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	7.00E+00	1.92E-02	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	4.00E+01	1.10E-01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	4.00E+01	1.10E-01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	4.00E+01	1.10E-01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	4.00E+01	1.10E-01	5.97E+01	1.00E+00
		7.00E+01			

POPULATION	CDI MG/KG/DAY	WC MG/L	WI L/DAY	RISK
ADULT 18-70	3.66E-06	3.60E-01	5.00E-02	5.50E-06
INFANT 0-2	1.10E-06	3.60E-01	5.00E-02	1.65E-06
YOUNG CHILD 2-6	8.29E-06	3.60E-01	5.00E-02	1.24E-05
CHILD 6-10	4.96E-06	3.60E-01	5.00E-02	7.44E-06
CHILD 11-14	1.87E-06	3.60E-01	5.00E-02	2.80E-06
CHILD 15-18	1.42E-06	3.60E-01	5.00E-02	2.12E-06
STAGED LIFETIME MODEL	2.13E-05			3.19E-05

TABLE E-8

INGESTION OF STREAM WATER

=====

B. UPPER MAURICE RIVER MOST PROBABLE CASE, MEDIAN ARSENIC WC: 0.124 MG/L

$$CDI = WC * WI * Fi * SF * YRS / 70 * BW$$

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	BW (KG)	Fi
ADULT 18-70	5.20E+01	7.00E+00	1.92E-02	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	7.00E+00	1.92E-02	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	4.00E+01	1.10E-01	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	4.00E+01	1.10E-01	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	4.00E+01	1.10E-01	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	4.00E+01	1.10E-01	5.97E+01	1.00E+00
	7.00E+01				

POPULATION	CDI MG/KG/DAY	WC MG/L	WI L/DAY	RISK
ADULT 18-70	1.26E-06	1.24E-01	5.00E-02	1.89E-06
INFANT 0-2	3.80E-07	1.24E-01	5.00E-02	5.69E-07
YOUNG CHILD 2-6	2.85E-06	1.24E-01	5.00E-02	4.28E-06
CHILD 6-10	1.71E-06	1.24E-01	5.00E-02	2.56E-06
CHILD 11-14	6.43E-07	1.24E-01	5.00E-02	9.64E-07
CHILD 15-18	4.88E-07	1.24E-01	5.00E-02	7.32E-07
STAGED LIFETIME MODEL	7.34E-06			1.10E-05

TABLE E-9

INGESTION OF FISH PATHWAY

=====

CASE A FROM FISH TISSUE UPPER MAURICE RIVER ONLY, MOST PROBABLE CASE

$$\text{CDI} = \text{FC} * \text{FI} * \text{Fi} * \text{RANGE OF YEARS} / 70 / \text{BW}$$

<u>POPULATION</u>	<u>RANGE OF YEARS</u>	<u>FC</u>	<u>FI</u>	<u>BW (KG)</u>	<u>Fi</u>
		<u>MG/KG</u>	<u>KG/DAY</u>		
ADULT 18-70	5.20E+01	9.10E-01	6.50E-03	7.00E+01	1.00E+0
INFANT 0-2	2.00E+00	9.10E-01	0.00E+00	8.95E+00	1.00E+0
YOUNG CHILD 2-6	5.00E+00	9.10E-01	0.00E+00	1.70E+01	1.00E+0
CHILD 6-10	5.00E+00	9.10E-01	6.50E-03	2.84E+01	1.00E+0
CHILD 11-14	3.00E+00	9.10E-01	6.50E-03	4.53E+01	1.00E+0
CHILD 15-18	3.00E+00	9.10E-01	6.50E-03	5.97E+01	1.00E+0
				7.00E+01	

<u>POPULATION</u>	<u>CDI</u>	<u>RISK</u>
	<u>MG/KG/DAY</u>	
ADULT 18-70	6.28E-05	9.42E-05
INFANT 0-2	0.00E+00	0.00E+00
YOUNG CHILD 2-6	0.00E+00	0.00E+00
CHILD 6-10	1.49E-05	2.23E-05
CHILD 11-14	5.60E-06	8.39E-06
CHILD 15-18	4.25E-06	6.37E-06
STAGED LIFETIME MODEL	8.75E-05	1.31E-04

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VIN 002 1001

TABLE E-10

INGESTION OF FISH PATHWAY

=====

CASE A FROM FISH TISSUE UPPER MAURICE RIVER ONLY, WORST CASE

$$CDI = FC * FI * Fi * RANGE OF YEARS / 70 / BW$$

POPULATION	RANGE OF YEARS	FC MG/KG	FI		BW (KG)	Fi
				KG/DAY		
ADULT 18-70	5.20E+01	9.10E-01	3.7E-02	7.00E+01	1.00E+0	
INFANT 0-2	2.00E+00	9.10E-01	6.5E-03	8.95E+00	1.00E+0	
YOUNG CHILD 2-6	5.00E+00	9.10E-01	6.5E-03	1.70E+01	1.00E+0	
CHILD 6-10	5.00E+00	9.10E-01	3.7E-02	2.84E+01	1.00E+0	
CHILD 11-14	3.00E+00	9.10E-01	3.7E-02	4.53E+01	1.00E+0	
CHILD 15-18	3.00E+00	9.10E-01	3.7E-02	5.97E+01	1.00E+0	
			7.00E+01			

<u>POPULATION</u>	<u>CDI</u>	<u>RISK</u>
	<u>MG/KG/DAY</u>	
ADULT 18-70	3.57E-04	5.36E-04
INFANT 0-2	1.89E-05	2.83E-05
YOUNG CHILD 2-6	2.49E-05	3.73E-05
CHILD 6-10	8.47E-05	1.27E-04
CHILD 11-14	3.19E-05	4.78E-05
CHILD 15-18	2.42E-05	3.63E-05
STAGED LIFETIME MODEL	5.42E-04	8.13E-04

TABLE E-11

INGESTION OF FISH CASE B (CALCULATED FROM WATER CONCENTRATION)

=====

UPPER MAURICE RIVER WORST CASE, MAXIMUM ARSENIC WC: 0.15 MG/L

$$CDI = (WC)(BCF)(FI)(YRS)/70/BW$$

POPULATION	YRS	FI (kg/day)	BW (KG)	Fi
ADULT 18-70	5.20E+01	3.70E-02	7.00E+01	1.00E+00
INFANT 0-2	2.00E+00	6.50E-03	8.95E+00	1.00E+00
YOUNG CHILD 2-6	5.00E+00	6.50E-03	1.70E+01	1.00E+00
CHILD 6-10	5.00E+00	3.70E-02	2.84E+01	1.00E+00
CHILD 11-14	3.00E+00	3.70E-02	4.53E+01	1.00E+00
CHILD 15-18	3.00E+00	3.70E-02	5.97E+01	1.00E+00
		7.00E+01		

POPULATION	CDI MG/KG/DAY	BCF L/KG	WC MG/L	RISK
ADULT 18-70	2.59E-03	4.40E+01	1.5E-01	3.89E-03
INFANT 0-2	1.37E-04	4.40E+01	1.5E-01	2.05E-04
YOUNG CHILD 2-6	1.80E-04	4.40E+01	1.5E-01	2.70E-04
CHILD 6-10	6.14E-04	4.40E+01	1.5E-01	9.21E-04
CHILD 11-14	2.31E-04	4.40E+01	1.5E-01	3.47E-04
CHILD 15-18	1.75E-04	4.40E+01	1.5E-01	2.63E-04
	3.93E-03			5.89E-03

TABLE E-12

INGESTION OF FISH CASE B (CALCULATED FROM WATER CONCENTRATION)

=====

UPPER MAURICE RIVER MOST PROBABLE CASE, MEDIAN ARSENIC WC: 0.124 MG/L

$$CDI = (WC)(BCF)(FI)(YRS)/70/BW$$

POPULATION	RANGE OF YEARS	FI KG/DAY	BW (KG)	Fi
ADULT 18-70	5.20E+01	6.50E-03	7.00E+01	1.00E+0
INFANT 0-2	2.00E+00	0.00E+00	8.95E+00	1.00E+0
YOUNG CHILD 2-6	5.00E+00	0.00E+00	1.70E+01	1.00E+0
CHILD 6-10	5.00E+00	6.50E-03	2.84E+01	1.00E+0
CHILD 11-14	3.00E+00	6.50E-03	4.53E+01	1.00E+0
CHILD 15-18	3.00E+00	6.50E-03	5.97E+01	1.00E+0
	7.00E+01			

POPULATION	CDI MG/KG/DAY	BCF L/KG	WC MG/L	RISK
ADULT 18-70	3.76E-04	4.40E+01	1.24E-01	5.65E-04
INFANT 0-2	0.00E+00	4.40E+01	1.24E-01	0.00E+00
YOUNG CHILD 2-6	0.00E+00	4.40E+01	1.24E-01	0.00E+00
CHILD 6-10	8.92E-05	4.40E+01	1.24E-01	1.34E-04
CHILD 11-14	3.36E-05	4.40E+01	1.24E-01	5.03E-05
CHILD 15-18	2.55E-05	4.40E+01	1.24E-01	3.82E-05
STAGED LIFETIME MODEL	5.25E-04		7.87E-04	

TABLE E-13

DIRECT CONTACT WITH STREAM WATER

BLACKWATER BRANCH WORST CASE MAXIMUM ARSENIC CONCENTRATION=6.2E-6 KG/KG

$$CDI=D*SA*WC*F1*SF*Fw*YRS/70/BW$$

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	D BW (KG)	D HRS/DAYS	D Fw
ADULT 18-70	5.20E+01	4.00E+01	1.10E-01	7.00E+01	4.0E+00	6.00E-02
INFANT 0-2	2.00E+00	4.00E+01	1.10E-01	8.95E+00	4.0E+00	1.20E-01
YOUNG CHILD 2-6	5.00E+00	8.00E+01	2.19E-01	1.70E+01	4.0E+00	1.20E-01
CHILD 6-10	5.00E+00	8.00E+01	2.19E-01	2.84E+01	4.0E+00	1.20E-01
CHILD 11-14	3.00E+00	8.00E+01	2.19E-01	4.53E+01	4.0E+00	6.00E-02
CHILD 15-18	3.00E+00	8.00E+01	2.19E-01	5.97E+01	4.0E+00	6.00E-02
				7.00E+01		

POPULATION	CDI MG/KG/DAY	WC KG/KG	F1 MG/CM ² -HR	SA CM ²	RISK
ADULT 18-70	1.73E-05	6.20E-06	5.00E-01	2.00E+04	2.60E-05
INFANT 0-2	1.04E-06	6.20E-06	5.00E-01	2.00E+03	1.56E-06
YOUNG CHILD 2-6	9.32E-06	6.20E-06	5.00E-01	6.80E+03	1.40E-05
CHILD 6-10	8.37E-06	6.20E-06	5.00E-01	1.02E+04	1.26E-05
CHILD 11-14	1.77E-06	6.20E-06	5.00E-01	1.15E+04	2.66E-06
CHILD 15-18	2.05E-06	6.20E-06	5.00E-01	1.75E+04	3.07E-06
STAGED LIFETIME MODEL	3.99E-05				5.98E-05

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TABLE E-14

DIRECT CONTACT WITH STREAM WATER

UPPER MAURICE RIVER WORST CASE MAXIMUM ARSENIC CONCENTRATION=1.5E-7 KG/KG

$$CDI=D*SA*WC*F1*SF*Fw*YRS/70/BW$$

POPULATION	RANGE OF YEARS	EVENTS /365 (SF)	D HRS/DAYS	Fw
	RIVER	BW (KG)		
ADULT 18-70	5.20E+01	4.00E+01	1.10E-01	7.00E+01
INFANT 0-2	2.00E+00	4.00E+01	1.10E-01	8.95E+00
YOUNG CHILD 2-6	5.00E+00	8.00E+01	2.19E-01	1.70E+01
CHILD 6-10	5.00E+00	8.00E+01	2.19E-01	2.84E+01
CHILD 11-14	3.00E+00	8.00E+01	2.19E-01	4.53E+01
CHILD 15-18	3.00E+00	8.00E+01	2.19E-01	5.97E+01
		7.00E+01		

POPULATION	CDI MG/KG/DAY	WC KG/KG	F1 MG/CM ² -HR	SA CM ²	RISK
ADULT 18-70	4.19E-07	1.50E-07	5.00E-01	2.00E+04	6.28E-07
INFANT 0-2	2.52E-08	1.50E-07	5.00E-01	2.00E+03	3.78E-08
YOUNG CHILD 2-6	2.25E-07	1.50E-07	5.00E-01	6.80E+03	3.38E-07
CHILD 6-10	2.02E-07	1.50E-07	5.00E-01	1.02E+04	3.04E-07
CHILD 11-14	4.29E-08	1.50E-07	5.00E-01	1.15E+04	6.44E-08
CHILD 15-18	4.96E-08	1.50E-07	5.00E-01	1.75E+04	7.43E-08
STAGED LIFETIME MODEL	9.64E-07				1.45E-06

TABLE E-15

DIRECT CONTACT WITH STREAM WATER

BALCKWATER BRANCH MOST PROBABLE CASE MEDIAN ARSENIC WC: .36E-6 KG/KG

CDI=D*SA*WC*F1*SF*FW*YRS/70/BW

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS		D HRS/DAYS	FW
			/365 (SF)	BW (KG)		
ADULT 18-70	5.20E+01	7.00E+00	1.92E-02	7.00E+01	2.60E+00	6.00E-02
INFANT 0-2	2.00E+00	7.00E+00	1.92E-02	8.95E+00	2.60E+00	1.20E-01
YOUNG CHILD 2-6	5.00E+00	4.00E+01	1.10E-01	1.70E+01	2.60E+00	1.20E-01
CHILD 6-10	5.00E+00	4.00E+01	1.10E-01	2.84E+01	2.60E+00	1.20E-01
CHILD 11-14	3.00E+00	4.00E+01	1.10E-01	4.53E+01	2.60E+00	1.20E-01
CHILD 15-18	3.00E+00	4.00E+01	1.10E-01	5.97E+01	2.60E+00	6.00E-02
			7.00E+01			

POPULATION	CDI MG/KG/DAY	WC KG/KG	F1 MG/CM ² -HR	SA CM ²	RISK
ADULT 18-70	1.14E-07	3.60E-07	5.00E-01	2.00E+04	1.71E-07
INFANT 0-2	6.88E-09	3.60E-07	5.00E-01	2.00E+03	1.03E-08
YOUNG CHILD 2-6	1.76E-07	3.60E-07	5.00E-01	6.80E+03	2.64E-07
CHILD 6-10	1.58E-07	3.60E-07	5.00E-01	1.02E+04	2.37E-07
CHILD 11-14	3.35E-08	3.60E-07	5.00E-01	1.15E+04	5.02E-08
CHILD 15-18	3.87E-08	3.60E-07	5.00E-01	1.75E+04	5.80E-08
STAGED LIFETIME MODEL	5.27E-07				7.91E-07

TABLE E-16

DIRECT CONTACT WITH STREAM WATER

UPPER MAURICE RIVER MOST PROBABLE CASE MEDIAN ARSENIC WC:1.24E-7 KG/KG

$$CDI=D*SA*WC*F1*SF*FW*YRS/70/BW$$

POPULATION	RANGE OF YEARS	DAYS AT RIVER	EVENTS /365 (SF)	D BW (KG)	D HRS/DAYS	D FW
ADULT 18-70	5.20E+01	7.00E+00	1.92E-02	7.00E+01	2.60E+00	6.00E-02
INFANT 0-2	2.00E+00	7.00E+00	1.92E-02	8.95E+00	2.60E+00	1.20E-01
YOUNG CHILD 2-6	5.00E+00	4.00E+01	1.10E-01	1.70E+01	2.60E+00	1.20E-01
CHILD 6-10	5.00E+00	4.00E+01	1.10E-01	2.84E+01	2.60E+00	1.20E-01
CHILD 11-14	3.00E+00	4.00E+01	1.10E-01	4.53E+01	2.60E+00	1.20E-01
CHILD 15-18	3.00E+00	4.00E+01	1.10E-01	5.97E+01	2.60E+00	6.00E-02
		7.00E+01				

POPULATION	CDI MG/KG/DAY	WC KG/KG	F1 MG/CM ² -HR	SA CM ²	RISK
ADULT 18-70	3.94E-08	1.24E-07	5.00E-01	2.00E+04	5.91E-08
INFANT 0-2	2.37E-09	1.24E-07	5.00E-01	2.00E+03	3.55E-09
YOUNG CHILD 2-6	6.06E-08	1.24E-07	5.00E-01	6.80E+03	9.09E-08
CHILD 6-10	5.44E-08	1.24E-07	5.00E-01	1.02E+04	8.16E-08
CHILD 11-14	1.15E-08	1.24E-07	5.00E-01	1.15E+04	1.73E-08
CHILD 15-18	1.33E-08	1.24E-07	5.00E-01	1.75E+04	2.00E-08
STAGED LIFETIME MODEL	1.82E-07				2.72E-07

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VIN 002 1009

APPENDIX F

TREATABILITY STUDIES FOR CHEMICAL FIXATION OF
ARSENIC AND SOLIDIFICATION OF SEDIMENT

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VIN 002 1010

**TREATABILITY STUDIES FOR CHEMICAL FIXATION
OF ARSENIC AND SOLIDIFICATION OF SEDIMENT**

**VINELAND CHEMICAL COMPANY SITE PROJECT
VINELAND, NEW JERSEY**

**TASK II
FINAL REPORT
December 11, 1987**

**Report Prepared For: EBASCO SERVICES INCOPORATED
REM III PROGRAM
U.S. ENVIRONMENTAL PROTECTION AGENCY
Task Leader: M. Kuo
Site Manager: W. Colvin
Project Identification No. WA-37.2LB8**

**Report Prepared By: LOPAT ENTERPRISES INCORPORATED
Wanamassa, New Jersey 07712
Project Supervisor: C. Falk
Project Manager: G. Gironda**

VIN 002 1011

Proj. I.D. No. WA-37.2LB8
 Ebasco: M. Kuo, W. Colvin
 Lopat Ent. Inc. Task II Report
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SEDIMENT SAMPLES

	<u>Untreated</u> <u>Log 87-64</u>	<u>Treatment</u> <u>1106-84-2</u>	<u>Treatment</u> <u>1106-85-1</u>	<u>Treatment</u> <u>1106-85-2</u>
Color	Black	Soil Brown	Soil Brown	Brown to Dark Grey
Physical Characteristics	Sandy, Silty	Cement -like friable solid	Hard clay	Dried mud consistency
Density, g/cc	1.0	2.11	1.83	1.37
Unconfined Strength ^a @8h: 0 Compressive Strength @24h: 0 Strength ^a @32h: 0 lbs/ft ² @48h: 0	0 8460 >9000 >9000	0 6000 8000 9000	0 0 0 590	0 0 0 590
% Increase in Volume due to Treatment	-33 ^b	-2 ^b	70	
% Increase in Weight Due to Treatment	40	79	133	

a) U.C.S. was done with a Soiltest Pocket Penetrometer Model CL-700 having a range between 0-9000 lb/ft² in 500 lb. increments. Each reported number is the average of 10 determinations.

b) A negative value represents a volume decrease.

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TREATED SEDIMENT SAMPLES

EP TOXICITY TEST RESULTS (in mg/l)

	1106-84-2	1106-85-1	1106-85-2	1106-91-2 (repeat of 1106-84-2)
As	1.5	1.2	1.0	0.80
Ba	0.6	0.5	0.6	0.8
Cd	<0.005	<0.005	<0.005	<0.005
Cr	0.05	0.04	0.01	0.03
Pb	<0.005	<0.005	<0.005	<0.005
Hg	<0.0002	<0.0002	<0.0003	<0.0002
Se	<0.005	<0.005	<0.005	0.009
Ag	<0.01	<0.01	<0.01	<0.01

Proj. I.D. No. MA-37.2LB8
Ebasco: M. Kuo, W. Colvin
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TREATED SEDIMENT SAMPLES

MEP Test Results of 1106-84-2

EP Tox	1	2	3	4	5	6	7	8	9	10
As 1.5	0.02	0.14	0.12	0.07	0.07	0.08	0.05	0.07	0.09	0.12
Ba 0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd <0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cr 0.05	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb <0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hg <0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Se <0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ag <0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

MEP Test Results for 1106-91-2
(Treatment the same as 1106-84-2)

EP Tox	1	2	3	4	5	6	7	8	9
As 0.80	0.32	0.20	0.08	0.05	0.05	0.06	0.05	0.05	0.06
Ba 0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd <0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cr 0.03	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Pb <0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hg <0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Se 0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ag <0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

ALL RESULTS REPORTED IN MILLIGRAMS PER LITER.

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LABORATORY TREATMENT OF SEDIMENT

ID#	1106-84-2 (and 1106-91-2)	1106-85-1	1106-85-2
Treatment	#4	#5	#6
Wt. of Sediment	400g	400g	400g
K-20 LS Part A	1.16g	1.16g	1.16g
K-20 LS Part B	.84g	.84g	.84g
Tap Water	20g	55g	119g
Fixative	8g Darco Gro-safe + 48g Class F Fly Ash + 144g Portland Cement Type I	8g Darco Gro-safe + 80g Class F Fly Ash + 160g Lime, Type SA + 80g Portland Cement Type I	8g Darco Gro-safe + 240g Class F Fly Ash + 240g Lime, Type SA

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LABORATORY AND SCALE-UP PROCEDURES AND RAW MATERIALS

COSTS FOR TREATED SEDIMENT SAMPLE 1106-84-2 or 1106-91-2

Laboratory Scale	Scale-up	Scale-up	
	(per ton of sediment)	(1 yd ³ of sediment=1686 lb)	Quantity (cost)
400g Sediment	2000 lb	1 yd ³ sediment	
20g Tap Water	100 lb	84.3lb	
2g K-20 LSC ^a	1 gal	(\$40.00)	0.843 gal (\$33.72)
8g Darco Gro-safe ^b	40 lb	(\$15.60)	33.7 lb (\$13.15)
48g Class F Fly Ash ^c	240 lb	(\$ 1.26)	202 lb (\$ 1.06)
144g Portland Cement Type I ^d	720 lb	<u>(\$24.12)</u>	<u>607 lb (\$20.33)</u>
	TOTAL	\$80.98	TOTAL \$68.26

Ingredients were added and mixed in the same order as listed.

-
- a) Lopat Enterprises K-20 LSC, \$40.00 per gal. FOB Wanamassa, NJ.
 - b) Darco Gro-safe activated carbon, American Norit Co., \$0.39 per lb, FOB Marshall, TX.
 - c) Class F Fly Ash, Ash Management Corp., \$10.50 per ton,(bulk)
FOB Trenton, NJ
 - d) Portland Cement, Saylor's Type I, Coplay Cement Co., \$67.00 per ton,(bulk)
FOB Nazareth, PA.

NOTE: The above raw materials costs are approximate, as they are determined by a laboratory screening treatment process. In most cases, pilot studies show that site treatment costs will be lower.

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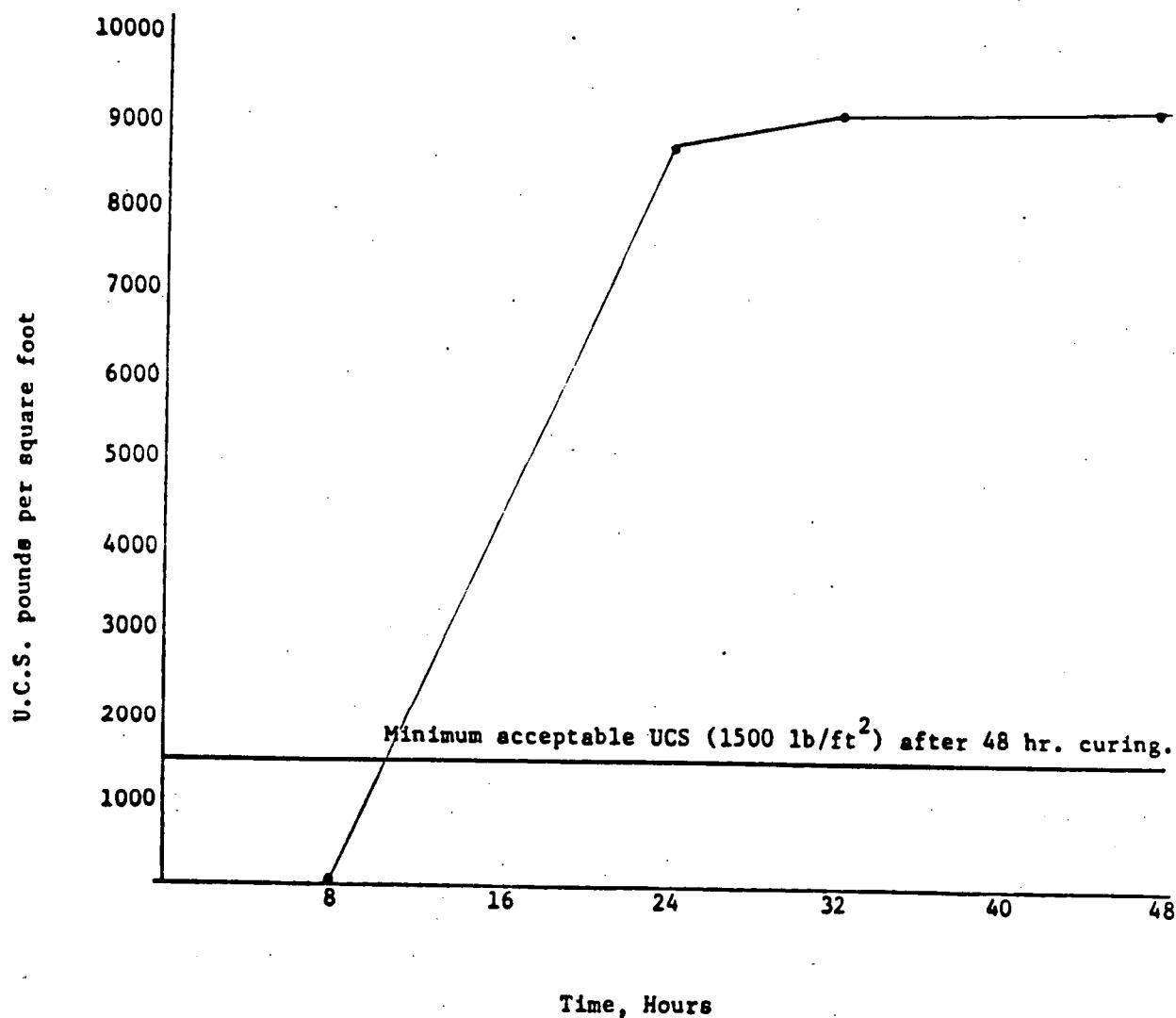
SAMPLE PREPARATION

Log 87-64: The sediment sample was in 3 phases. Approximately 30% of the sample was sand, 30% was organic silt and the remainder was liquid. The bucket was stirred as well as possible but there was obvious stratification. To take 400g samples, a 3/4 inch I.D. pipe was plunged into the bottom of the bucket to get a sand sample of approximately 200g. A plastic scoop was used to remove approximately 200g of sediment. The only liquid transferred was that which was reasonably unavoidable.

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Unconfined compressive strength vs. time

Treated Sample: 1106-84-2 Sediment



Time, Hours

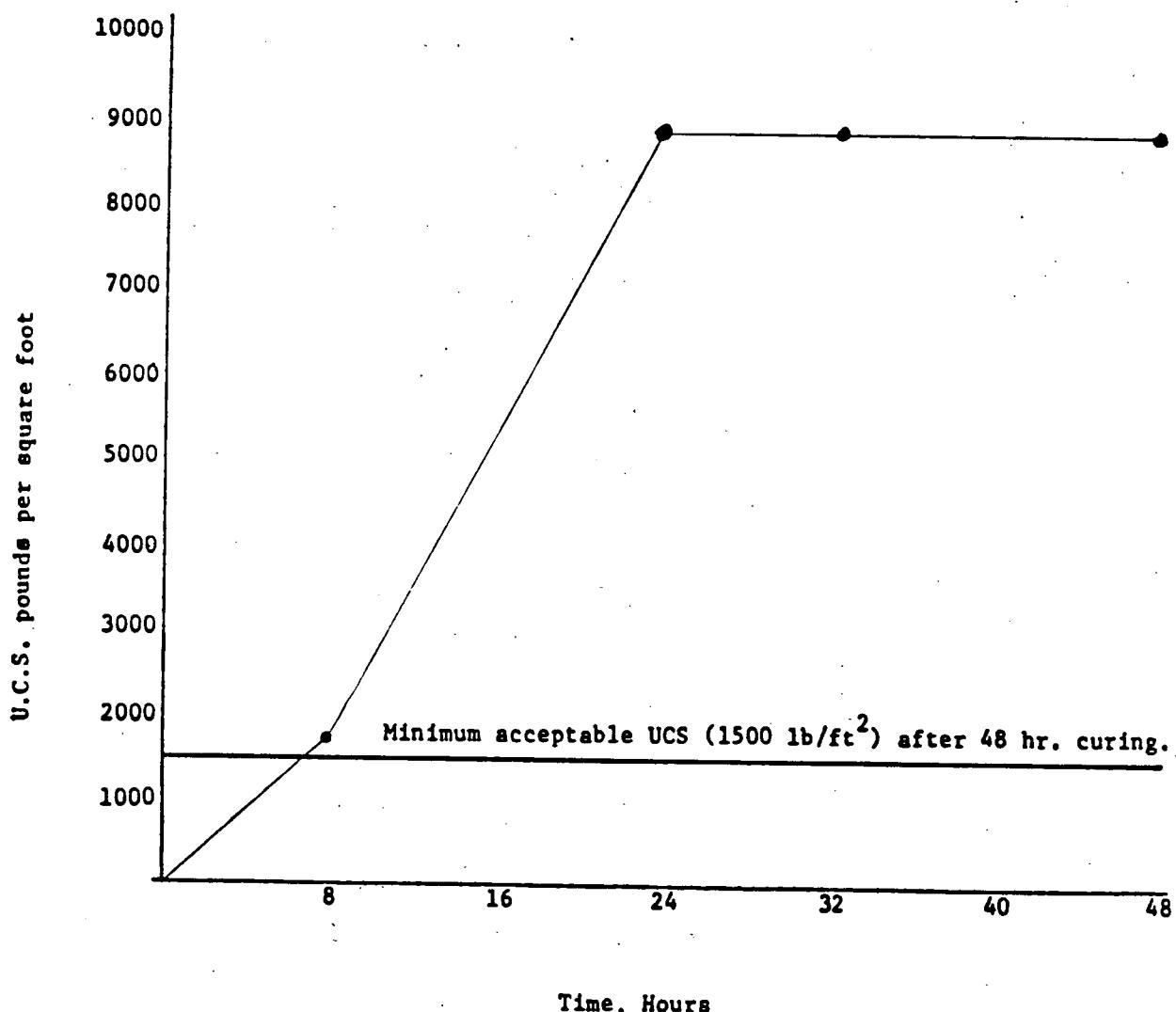
NOTE: Each plotted point is the average of 10 U.C.S. determinations

VIN 002 1018

Proj. I.D. No. WA-37.2LB8
Ebasco: M. Kuo, W. Colvin
Lopat Ent. Inc. Task II Report
December 11, 1987

Unconfined compressive strength vs. time

Treated Sample: 1106-91-2 Sediment (same treatment as 1106-84-2)



NOTE: Each plotted point is the average of 10 U.C.S. determinations

VIN 002 1019

VIN 002 1020

APPENDIX G

**TREATABILITY STUDIES FOR EXTRACTION OF ARSENIC
FROM SOIL COLLECTED FROM THE
VINELAND CHEMICAL SITE**

VIN 002 1021

8519b

REM III PROGRAM

EPA CONTRACT NO. 68-01-7250

TREATABILITY STUDIES FOR EXTRACTION
OF ARSENIC FROM SEDIMENT COLLECTED
FROM THE VINELAND CHEMICAL SITE

FINAL REPORT

DECEMBER 9, 1987

HITTMAN EBASCO ASSOCIATES INC.

ESI-1002-601

VIN 002 1022

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I. INTRODUCTION

Sediment samples were collected from the Blackwater Branch and the unlined lagoon located at the Vineland Chemical Company (ViChem) Site in Cumberland County, New Jersey. The sediment samples were combined in a 5 gallon plastic bucket and delivered to the Hittman Ebasco Laboratory in Columbia, Maryland on July 20, 1987. The composite sample was stored in a walk-in cold room at approximately 4°C.

After an initial chemical and physical characterization of the composite sample, bench-scale treatability tests were performed to determine the feasibility of removing arsenic from the solid phase. A number of batch extraction experiments were conducted using tap water, with and without chelating compounds added, at acid, alkali and neutral pH, and at temperatures between 20 and 50°C.

During the treatability work, the scope of the original project was changed. The inability of the batch treatments to consistently produce solids containing less than 20 mg/Kg total arsenic, and the production of relatively large volumes of non-filterable aqueous waste with high suspended solids and arsenic content, made further investigations unwarranted. Therefore, many of the experiments described in the Base-Bid Technical Specifications were eliminated.

This report summarizes the experimental methods, analytical protocols and results of the treatability study performed by personnel from Hittman Ebasco Associates Inc. under the direction of Ebasco Services Incorporated. The results of the sample characterization analyses, a comparison of the efficacy of the extraction agents and an evaluation of the effects of pH and temperature on arsenic removal from the ViChem sediment are presented.

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002 1024

II. SUMMARY OF ANALYTICAL METHODS

<u>Analyte</u>	<u>Method</u>
Aluminum	200.7 (Ref. 2)
Arsenic	7060 (Ref. 1)
Calcium	215.1 (Ref. 2)
Iron	236.1 (Ref. 2)
Total Organic Carbon	9060 (Ref. 1)
% Solids	160.1 (Ref. 2)
Particle Size	ASTM D422

REFERENCES

1. "Test Methods for Evaluating Solid Wastes", EPA SW-846, 3rd Edition, 1986.
2. "Methods for Chemical Analysis of Water and Wastes" EPA-600/4-79-020, 1979.

VIN 002 1025

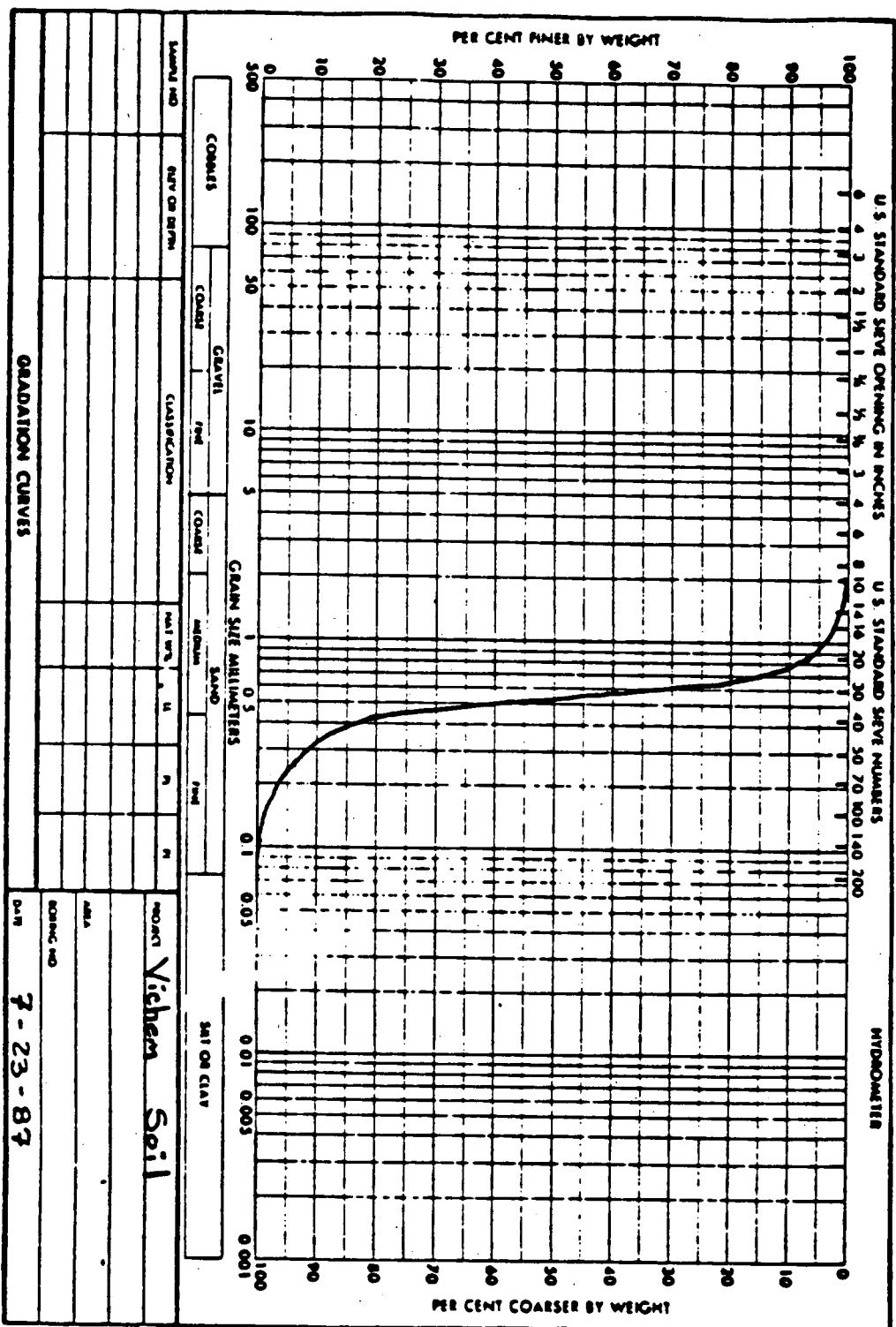
III. SUMMARY OF RESULTS: SEDIMENT TESTS

A.	INITIAL CHARACTERIZATION	(Total mg/Kg)	
	Aluminum	13,600	
	Arsenic	2,870	
	Calcium	Not detected	
	Iron	8,890	
	TOC	70,000	
	% Solids	11 %	
B.	ROOM TEMPERATURE EXTRACTIONS WITHOUT CHELATORS		
	sediment at pH = 3	36 total arsenic (mg/Kg)	
	sediment at pH = 7*	36	
	sediment at pH = 12*	14	
C.	ROOM TEMPERATURE EXTRACTIONS AT pH = 7 WITH CHELATORS		
	sediment with citrate	21 total arsenic (mg/Kg)	
	sediment with oxalate	45	
	sediment with EDTA	37	
D.	FURTHER EXTRACTIONS WITH CITRATE AT VARIOUS pH AND TEMPERATURE		
	sediment at pH = 5, T = 24°	21 total arsenic (mg/Kg)	
	sediment at pH = 7, T = 50°	44	
	sediment at pH = 5, T = 50°	32	
E.	PHASE SEPARATION BY SETTLING AND ARSENIC CONTENT		
	Total volume of suspension:	700 ml	
		Settling Time Liquid Volume Solid Volume	
	1 minute	570 ml	130 ml
	10 minutes	550	150
	1 hour	530	170
	24 hours	520	180
		unfiltered	washed
	Total Arsenic (wet)	82 mg/Kg	2.0 mg/Kg
	% solids	4%	80%

* pH values > 5 required large amounts of NaOH and were difficult to maintain.

VIN 002 1026

PARTICLE SIZE - VICHEM SEDIMENT



VIN 002 1027

IV. DESCRIPTION OF EXPERIMENTS PERFORMED

Simple batch extraction experiments performed on the ViChem sediment sample at room temperature (Section III. A-C) were carried out by combining 200 grams of undried sample with 200 ml of tap water in a 1L pyrex griffin beaker. When chelating agents were added, the following compounds were used in the amounts given below:

<u>Chelator</u>	<u>Grams Added per Beaker</u>
sodium citrate	1.03
sodium oxalate	1.13
tetrasodium EDTA	0.46

These additions resulted in a final concentration of the chelating agent of approximately 0.01 molar. Next, the pH of the solution was adjusted as necessary with 1 + 1 hydrochloric acid or 5N sodium hydroxide.

Solutions were stirred on a Phipps and Bird paddle stirrer at 30-40 rpm for two hours with periodic monitoring and adjustment of pH. After two hours of continuous stirring, the solids were allowed to settle for 30 minutes and the supernatant decanted. Retained solids were washed three times with tap water to remove any residual reagent and submitted to the lab for analysis.

Further sediment extractions (Section III. D) were performed with the citrate chelator at various pH and temperature regimes. Each experiment was carried out in a 500 ml 3-neck round bottom reaction flask fitted with a heating mantle, a thermometer and a combination pH electrode. Solutions were stirred at 30-40 rpm for two hours after which the separation and washing of the solids were performed as before.

For the phase separation/settling experiment (Section III. E), 400g of sediment, 400 ml of tap water and 2.06 g sodium citrate were combined to make a suspension of 700 ml total volume. This suspension was stirred rapidly (80-100 rpm) on a paddle stirrer for two hours. Although approximately 20 ml of 5N sodium hydroxide was added during the extraction procedure, the final pH was only (6.3). Immediately after stirring, the solution was poured into a 1000 ml graduated cylinder so that liquid and solid volumes could be measured over a 24-hour period. After the final volume measurements were taken, a 100 ml portion of the organic-rich supernatant was poured off from the top of the cylinder and analyzed for total arsenic. The heaviest solid fraction was then thoroughly washed with tap water to remove all visible organic material and the resulting sand analyzed for total arsenic.

V. DISCUSSION OF RESULTS

The ViChem sediment sample proved to be a difficult matrix on which to perform treatability experiments. The composite sample is a black, soupy, organic-rich sandy sludge. Its natural pH is between 5.5 and 6.5, and because of the large proportion of humic substances, maintaining an extraction pH in excess of this range proved difficult. Addition of sodium hydroxide is not an effective means of raising the pH due to subsequent release of organic acids. Even 400 ml of 5N NaOH was insufficient to keep the pH of the system above 7 toward the end of the two-hour batch extraction experiments. Follow-on field extractions to remove arsenic from the ViChem sediments will require large amounts of reagents and continuous monitoring if these extractions are to be conducted at other than acidic pH values.

As can best be shown by the arsenic content of the liquid and solid phases of the sediment following treatment, the arsenic contained in the ViChem sediment is associated with the organic material and not tightly bound to the sand fraction. Throughout the various extraction experiments, treatments that removed organic material such as solubilization by addition of NaOH followed by decantation and thorough washing, removed the most arsenic from the solid fraction. Chelators, elevated temperatures and pH adjustments between 5 and 7 had little effect in producing solids that met the target criterion of less than 20 mg total arsenic per Kg of dry solids (all arsenic values are expressed on a dry weight basis unless otherwise noted).

In addition to the inability of batch extraction techniques studied herein to meet the 20 mg/kg target, large amounts of aqueous, black, organic-rich, arsenic wastes were produced from decantation of the

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extract supernatant solutions and multiple washings of the retained solids. This aqueous waste would have to be treated and treatment for ultimate disposal was not investigated in this study. Reduction of volume by dewatering may prove to be the most difficult step. The very fine contaminated organic suspensions do not settle out. Even after the 24-hour settling experiment, the liquid fraction remained opaque and immediately clogged the large (15 cm diameter) Watman GF/F glass fiber filters used in unsuccessful attempts at filtering through Buchner funnels under vacuum.

In summary, the batch extraction experiments conducted on the ViChem sediment supplied by Ebasco were not effective in lowering their arsenic content to a level that would comply with disposal protocols. Another serious drawback was the generation of relatively large volumes of aqueous wastes containing leached arsenic and fine suspended particulates that will be difficult to treat by conventional methods. Thus, simple batch extraction treatments using citrate, oxalate or EDTA chelators in combination with elevated temperatures to 50°C and solution pH adjustments between 5 and 12 did not provide conditions favorable for treatment of these contaminated wastes.

VIN 002 1031

VI. APPENDIX OF LABORATORY DATA

VIN 002 1032

QA/QC DATA SUMMARY
LAB CONTROL RESULTS

CLIENT: VINELAND CHEMICAL/SEDIMENTS

CONTRACT NO: ESI -1002-101

UNITS: ARSENIC, ug/L

TOTAL ORGANIC CARBON, mg/L

PARAMETER	QC RESULT	QC TRUE VALUE	% RECOVERY
TOC	1140	1160	98
ARSENIC	82	80	103
TOC	1020	1160	88
ARSENIC	84	80	105
TOC	1020	1160	88

NOTE: Blanks were digested and analyzed during each sample preparation procedure. All blank values were below instrumental detection limits for Arsenic (5 ug/L).

VIN 002 1033

QA/QC DATA SUMMARY
DUPLICATE RESULTS

CLIENT: VINELAND CHEMICAL/SEDIMENTS

CONTRACT NO: ESI -1002-101

UNITS: ARSENIC, ug/L
TOC mg/kg

PARAMETER	SAMPLE ID	SAMPLE RESULT	DUPLICATE RESULT	% DIFFERENCE
ARSENIC	4990	91	104	13
TOTAL ORGANIC CARBON	4910	<100	<100	NON-CALCULABLE

VIN 002 1034

QA/QC DATA SUMMARY
SPIKE RESULTS

CLIENT: VINELAND CHEMICAL/SEDIMENTS
CONTRACT NO: ESI-1002-101
UNITS: ARSENIC ug/L
TOTAL ORGANIC mg/L

PARAMETER	SAMPLE ID	SAMPLE RESULT	SPIKE RESULT	SPIKE ADDED	% RECOVERY
ARSENIC	4990	91	296	40	513 N
TOC	4910	<100	755	1000	76

N = SPIKE RECOVERY OUT OF CONTROL WINDOW OF 75 - 125%. MATRIX INTERFERENCE IS INDICATED.

VIN 002 1035

APPENDIX H

VIN 002 1036

APPENDIX H
TOXICITY PROFILES

VIN 002 1037

6241b

APPENDIX H

Toxicity Profile - Arsenic

Aquatic Biota

The mechanism of arsenic toxicity to aquatic organisms is not well understood; however, arsenic readily forms kinetically stable bonds with sulfur and carbon in organic compounds. Since arsenic (+3) reacts with sulfhydryl groups of proteins, enzyme inhibition by this mechanism may be the primary mode of arsenic toxicity. Arsenate (+5) does not react with sulfhydryl groups as readily but may uncouple oxidative phosphorylation (Anderson et al. 1975).

In general, arsenic toxicity was increased with increased duration of exposure for fish. Higher temperatures also appeared to increase arsenic toxicity (Sorenson, 1976), whereas water hardness had no significant effect. Effects of other parameters such as pH, suspended solids, and organic content in the water were not found in the literature.

Early life stages of freshwater aquatic organisms appear to be the most sensitive indicator of arsenic toxicity. The lowest value obtained for all of the trivalent inorganic arsenic data was for an early life stage exposure with the toad which resulted in a 7-day LC₅₀ of 40 ug/l (Beijei, 1979).

Acute Toxicity

The range of acute values for trivalent inorganic arsenic (sodium arsenite) in crustaceans varied from 812 to 5,278 ug/l. The range of LC₅₀ values for the seven species of fish tested was from 13,340 to 41,760 ug/l (USEPA, 1980). The values reported for the few fish and invertebrate species exposed to sodium arsenite (+5) were comparable to those for exposure with these species to sodium arsenite. Thus, the two valence states appeared to be similarly toxic to aquatic organisms. For mammals, soluble As (+3) compounds are more toxic than pentavalent compounds. In addition, extremely high acute toxicity values were reported for species exposed to monosodium methanearsonate, indicating that organic arsenic may be much less toxic than both trivalent and pentavalent inorganic arsenic.

Chronic Toxicity

Only one chronic test has been found in the literature. In this life cycle test with *Daphnia magna* exposed to sodium arsenite a chronic value of 912 ug/l was observed (USEPA, 1980). USEPA has set a standard of 440 ug/l for the maximum recoverable trivalent inorganic arsenic concentration permitted in water for the protection of freshwater aquatic life (USEPA, 1980).

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Human Effects

The major routes of arsenic exposure are inhalation or ingestion. Percutaneous absorption of arsenic can occur in man, but appears to be a relatively minor route of exposure except under certain occupational exposure conditions. Respiratory absorption of arsenic depends on chemical species of arsenic and the particulate size. Particles less than 1 um in diameter are deposited deeper in the respiratory tract, and subsequently absorbed via the alveolar parenchyma. Larger particles tend to be deposited mainly in the upper portion of the respiratory tract, undergo retrociliary movement, and ultimately are swallowed. Holland & coworkers (Holland, 1959) observed that 75 to 85 percent of the deposited arsenic was absorbed from the lungs within four days. In man, gastrointestinal adsorption of arsenic depends on the chemical form of the element and its physical characteristics. Soluble arsenicals are generally more extensively absorbed than the insoluble forms. It has been shown that greater than 95 percent of inorganic arsenic taken orally by man appears to be absorbed (Ray, 1975). Once arsenic is absorbed into the blood stream, it is distributed to the heart, kidney, liver, lung and brain (Kadowski, 1980), but the highest arsenic levels are found in skin, hair, teeth, bone and nail. Thus, these are the arsenic storage organs.

Oral doses of about 70 to 180 mg of trivalent arsenic may be fatal to adults (Valle, 1960). Oral exposure of humans to arsenic produces a range of gastrointestinal disturbances, whereas hemolysis is the primary manifestation of arsine poisoning. The first symptoms of acute poisoning is often a feeling of throat constriction, followed by difficulty in swallowing, epigastric discomfort, and violent abdominal pain accompanied by vomiting and watery diarrhea. Intense thirst is usually present. Systemic collapse with severe hypotension probably reflects widespread damage to the muscular system. Death which is generally preceded by restlessness, convulsions, or coma, may result from cardiac failure.

Chronic arsenic poisoning produces a range of symptoms including hyperpigmentation around the eyelids, temple, nipples, neck and groin; hyperkeratosis (precancerous skin lesions), "Blackfoot's disease" (peripheral vascular disease leading to gangrene of the extremities), hepatic and renal injury, peripheral and central neuropathy, and decreased hemoglobin production. Arsenic exposure has been shown to result in chromosome aberrations and sister chromatid exchange in humans (Burgdorf, 1977). There is clear evidence that chronic oral exposure to elevated levels of arsenic increases the risk of skin cancer. The most common lesions are squamous cell carcinomas which appear to develop from the hyperkeratinized lesions described earlier. Epidemiological studies of workers in smelters have indicated inhalation exposure to arsenic may be associated with increased risk of lung cancer (USEPA, 1986).

Bioaccumulation in Aquatic Animals

Studies have shown that arsenic is not bioconcentrated to a high degree and that lower forms of aquatic life may accumulate more arsenic residues than fish. Arsenic accumulation in freshwater aquatic organisms does not appear to be greatly affected by the form of arsenic present, although the highest residues were seen in exposures to the trivalent inorganic form.

Isensee et al., (Isensee, 1973) investigated the bioaccumulation of two organic arsenicals, cacodylic acid and dimethylarsine for a total of 32 days in a model ecosystem that contain algae, snails, daphnia, and fish. The result was that fish exhibited the least accumulation, with a bioconcentration factor (BCF) of 21 for cacodylic acid and 34 for dimethylarsine. Snails accumulated the compounds to a greater extent, with bioconcentration factors which ranged from 110 to 446. Two planktonic components concentrated arsenic the most, with bioconcentration factors ranging from 736 to 2175. Thus it can be concluded that the arsenic compounds did not show a tendency to biomagnify (increase in concentration as trophic level increase).

Available data have shown that arsenic bioaccumulation in fish varies widely, and depends upon such aspects as water concentration, tissue measured, modes of uptake, health of the fish, position in the food chain, and types of experiment (i.e., lab vs field measurements) used to determine bioaccumulation.

BCF Estimation from Laboratory Studies

Sorensen (1976) reported the results of a 15 day exposure study of green sunfish to high levels of sodium arsenate in water (100, 500, 1000 ppm). All levels were found to be toxic and the whole body BCFs ranged from 3.3 at 100 ppm exposure to 0.58 at 1,000 ppm exposure.

Spehar et al., (1980) reported the results of a 28 day flow through experiment with rainbow trout. Fish were exposed to 0.1 and 1.0 ppm As concentrations and the analytical detection limit for tissue As was 1 ppm and 6 ppb for As in water. The BCFs derived from this study are for the whole body, and show that the lower the concentration the higher the BCF.

As Exposure (ppm)	As in H ₂ O (ppm)	As in Tissue ppm	BCF*
Control	.006	3	500
0.1	0.1	3	30
1.0	1.0	3	3

* BCF = $\frac{\text{As in tissue}}{\text{As in H}_2\text{O}}$

This high variability in BCF may be due in fact to measured levels in tissue being close to the detection limit for As.

Skinner et al., (1982) in a 128 day continuous flow through experiment measured whole body As uptake in bluegill and fathead minnow. The mean BCFs derived from this study ranged from 70-227 for fathead minnow and 45-70 for Bluegill.

BCF Estimation from Field or Model Ecosystem Studies

In 1966, Gilderhus reported on the effects of the application of sodium arsenite to pools in which immature and adult bluegills were stocked. The pools were first covered with soil, then water, and stocked with typical bottom plants. The BCF values derived from the results after 16 weeks exposure ranged from 19 at 0.01 ppm water concentration to 1.3 at 1.02 ppm water concentration.

In a study of As in a contaminated aquatic ecosystem, Thompson et al., (1972) reported a BCF of 91. Skinner (1986) studied the effects of As on fish in effluent basins and measured water and fish muscle As levels. He found BCF levels to be as low as 1.3 for sunfish and as high as 60 for carp and catfish living in these basins.

The following table summarizes the results for BCF from the aforementioned studies:

<u>Reference</u>	<u>Study Type</u>	<u>BCF Range</u>
Sorensen, 1976	lab	0.58 - 3.3*
Spehar, et al., 1980	lab	3 - 500**
Skinner, et al., 1982	lab	45 - 227***
Gilderhus, 1966	Model Ecosystem	1.3 - 45
Thompson, et al., 1982	field	91
Skinner, 1986	field	1.3 - 60

* levels of exposure were toxic

** measurements in fish tissue may not be different than the detection limit

*** whole body fish concentrations

Since the laboratory studies have significant experimental design limitations, bioaccumulation is probably best represented by field studies because uptake from all routes is assessed. All of the field studies showed that the BCF for As is somewhere between 1 and 100. It is therefore assumed that 50 will be the best estimate of BCF with minimum and maximum values of 0.1 and 500 respectively.

During Ebasco's Phase II remedial investigation of the ViChem site, fish, shellfish and water samples were collected from the river areas (see sections 2.4 and 4.3). Five fish tissue samples were analyzed for total arsenic concentration. Table H-1 shows the arsenic concentration in fish tissue, and the calculated bioconcentration factors.

Metabolism and Biotransformation

Arsenic metabolism has been investigated in animals and humans (Vahter, M, 1983; Marafantl et al. 1987) and the following conclusions can be made:

- Dimethylarsenic acid (DMAA) is the major metabolite in most animals and humans. It is also the major metabolite that appears in the urine.
- The major site of methylation is the liver.
- Monomethylarsenic acid (MMAA) is most often a secondary metabolite and its appearance in urine varies with the animal species.
- MMAA can be partially methylated to DMAA, but neither species is significantly demethylated to inorganic arsenic.
- Methylation is a detoxification step of inorganic arsenic, and increases the rate of arsenic excretion.
- Trivalent arsenic is the substrate for methylation, and arsenic (+5) must be reduced to arsenic (+3) before methylation can occur.
- Methylation is a dose-dependent process. The percentage of DMAA in urine decreases with increasing inorganic arsenic dose level, while the amount of retained arsenic increases.

Arsenic in marine organisms is primarily in the organic form. In a survey of arsenic in marine organisms, 0-7% of the total arsenic was found to be inorganic arsenic and most of the organic arsenic (84%) was water soluble and therefore more readily excreted.

TABLE H-1
VINELAND CHEMICAL COMPANY SITE
BIOCONCENTRATION FACTORS OF ARSENIC

<u>Organism</u>	<u>As in H₂O¹</u> <u>(mg/l)</u>	<u>As in</u> <u>tissue (mg/kg)</u>	<u>BCF</u> <u>(l/kg)</u>
<u>Upper Maurice</u>			
White Bass	0.124	2*	
Bluegill	0.124	2*	
Black Bullhead	0.124	0.91	7.3
<u>Lower Maurice</u>			
Catfish	0.021	1*	
Crab Backfin	0.021	1.5	71.4
Crab Hepatopancreas	0.021	1.6	76.2
American Oyster	0.021	1.3	61.9
Yellow Perch	0.021	1*	
<u>Delaware Bay</u>			
American Oyster		1.2	

* Less than the concentration listed
 1 Median concentration were used

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In a study of smelter workers exposed to As_2O_3 and individuals with typical dietary exposure to arsenic, Buchet et al., (1980) reported that urinary excretion of arsenic from these subjects was about 60% DMAA, 20% MMAA, and 20% inorganic arsenic. Braman and Foreback (1973) have also analyzed the urinary excretion of arsenic in four human volunteers. About two-thirds of the total urine arsenic concentrations were present as dimethylarsenic acid and 17 percent as pentavalent inorganic arsenic. Trivalent inorganic and methylarsenic acids were present at 8 percent each.

Arsenic can also be biotransformed by microorganisms in the environment. In marine organisms, arsenic is transformed to both lipid soluble and water soluble organic arsenic compounds (Lunde, 1977). Algae in waters with low phosphate concentrations can metabolize arsenate to a membrane phospholipid, O-phosphatidyltrimethylarsonium lactate (Benson & Summons, 1981) whereas in the flesh of fish, shellfish, and crustaceans, arsenobetaine is the principal organic arsenic compound (Cannon et al. 1983, Tam et al. 1982).

Mercury Fate and Transport

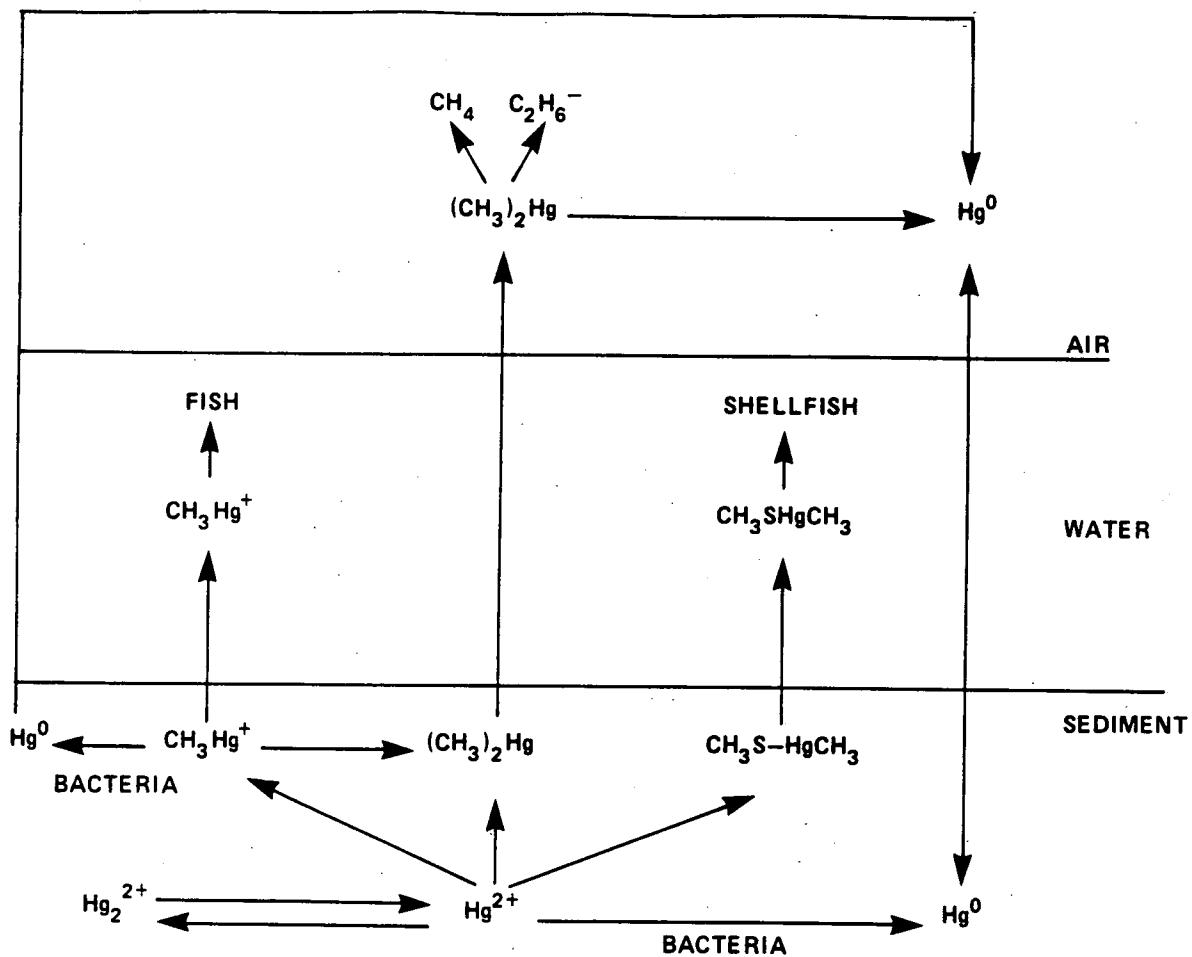
Mercury, a silver-white metal, can exist in the environment in three oxidation state: elemental, mercurous (+1), and mercuric (+2) state. It can also be part of inorganic or organic compounds (EPA, 1980). In general, mercurous salts are much less soluble in water, and are much less toxic than the mercuric forms.

O Aqueous Speciation

Mercury can be present in any one of the three different oxidation state in the aquatic environment. Depending on pH, alkalinity, oxidation-reduction potential, and other variable, a wide variety of chemical species are formed. Some of these complex ions have considerable aqueous solubility while other are quite insoluble. For example, HgCl_2 in solution can speciate into $\text{Hg}(\text{OH})_2$, Hg^{2+} , HgCl^+ , $\text{Hg}(\text{OH})^-$, HgCl_3 and HgCl_4^{2-} (Boudon and Ribeyre, 1983). Within a moderately oxidizing environment above pH 5, the predominant mercury species is elemental mercury. Under mildly reducing condition of sediments, mercury can be precipitated as the sulfide, HgS (Callahan et al, 1979).

Under naturally occurring conditions of pH and temperature, divalent mercury in sediment (The National Research Council, 1978) and estuarine areas (Jernelov, 1971) can be methylated by aerobic and anaerobic bacteria. (Figure H-1). The principal product of biological methylation is monomethyl mercury (Methylmercury), which is more water soluble. Methylmercury is the most hazardous mercury species because of its high stability, its lipid solubility, and its possession of ionic properties that lead to a high ability to penetrate membranes in

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SOURCE: CALLEHAN ET AL., 1979.

U.S. ENVIRONMENTAL PROTECTION
AGENCY

VINELAND CHEMICAL COMPANY SITE

FIGURE H-1

THE BIOLOGICAL MERCURY CYCLE
IN THE AQUATIC ENVIRONMENT

EBASCO SERVICES INCORPORATED

living organisms (Beijei and Jernelov, 1979). In addition, insoluble dialkyl covalent mercury compounds may also appear in natural waters at trace levels.

o Adsorption/Desorption

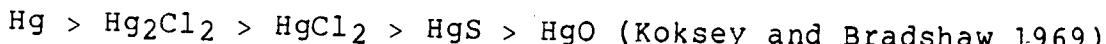
The major removal mechanism of mercury from a natural water system is adsorption onto the surfaces of particulates and subsequent settling to the bed sediment (Callahan et al., 1979). The majority of any dissolved mercury is removed in this manner within a relatively short time. The adsorbed species is probably not a methylated mercury compound (Carr and Wilkness, 1972; Kado et al., 1977).

Mercury sorption capacity is closely related to sediment organic content (Ramamoorthy and Rust, 1976), and aquatic chloride concentration (Reimers and Krenkel, 1974), and is little affected by pH. Adsorption of inorganic mercury on the inorganic oxide components of sediment is suggested to be very small (MacNaughton and James, 1974).

Desorption rate of mercury is reported to be low e.g., less than 1 percent mercury was leached from the sediment after 70 hours agitation in distilled water (Ramamoorthy and Rust, 1976).

o Volatilization

Volatilization is an important removal process for mercury in aquatic systems. The rate of vaporization of mercury and some of its inorganic compounds follows the sequence



Precipitation is the primary mechanism for removal of mercury from the atmosphere.

o Photolysis

Photolysis is important in the chemical speciation of mercury in the atmosphere and perhaps in the aquatic environment. A photolytic breakdown of dimethyl mercury in the atmosphere to methyl mercury (Johnson and Braman, 1974) and photodecompositions of phenyl mercury compounds in both the atmosphere and natural waters (Zepp et al. 1973) have been suggested.

Toxicity Profile - Mercury

Aquatic Biota

o Acute Toxicity

For inorganic mercury, acute 96-hour LC₅₀ values ranged from 0.02 ug/l for male crayfish to 2000 ug/l for larvae of a

caddisfly (EPA, 1980). Rainbow trout is the most acutely sensitive of the tested fish species and methyl-mercuric chloride is about ten times more acutely toxic to rainbow trout than mercuric chloride. Acute values for mercuric chloride in saltwater aquatic life ranged from 3.5 ug/l to 1,680 ug/l with winter flounder as the most resistant species and the mysid shrimp the most sensitive (USEPA, 1980).

o Chronic Toxicity

Chronic toxicity values with Daphnia magna on three different kinds of mercury compounds were between 1.0 and 2.47 ug/l. For the mysid shrimp, the highest concentration of mercuric chloride at which no adverse effect on reproductive processes was detected at 0.82 ug/l; and the chronic value is 1.2 ug/l (USEPA, 1980).

Human Effects

Occupational and accidental methylmercury exposure indicated that the principal signs and symptoms of poisoning would not occur during the initial 3 to 4 months of exposure. Then symptoms that were confined to the nervous system surfaced, including paresthesia of the extremities, impaired peripheral field of vision, slurred speech, and unsteadiness of gait and limb. Methylmercury poisoning also caused cardiovascular effects due to renal and cardiac damage (Jalibi and Abbasi, 1961). Exfoliative dermatitis have been reported from skin contact or oral ingestion of methyl- and ethyl-mercury compounds (Damliyi et al., 1976). Fetal methylmercury poisoning has resulted in mental and psychomotor retardation (Harada, 1968). Children suspected of prenatal and early postnatal methylmercury exposures (age 8 to 16) exhibited at a higher incidence of neurological deficits, learning difficulties, and poor performance on intelligence tests than children of similar age from control area (Med. Tribune, 1978).

Lethal oral dose of inorganic mercury in the form of mercurous chloride has been estimated to be between 1 and 4 grams (Gleason et. al, 1957). Death is due to acute renal failure. Inorganic mercury compounds have been shown to be diuretic in dogs (Mudje and Weiner, 1958). Exposure to high concentrations of mercury vapor (greater than 1 mg Hg/m³) can damage lung tissue, causing acute mercurial pneumonitis (Milne et al. 1970). Classical signs of mercury vapors poisoning, including mental disturbances, objective tremors and gingivitis occur in workers following chronic exposures to average air concentrations above 0.1 to 0.2 mg Hg/m³ (Rentos and Seligmann, 1968). Nonspecific symptoms such as loss of appetite, weight loss, and shyness occurred at a greater frequency than in the control group at average air concentrations of 0.06 to 0.1 mg Hg/m³.

Embryotoxicity and teratogenicity of methyl-mercury (Oharayama, 1968), and inorganic mercury (Gale and Fern 1971) have been reported in animals. In humans, although brain damage due to prenatal exposure to methyl-mercury has occurred, no anatomical defects have been reported. However, spontaneous abortion and high mortality rate among infants born to women who displayed symptoms of mercury poisoning has been reported (Baranski and Szymczyk, 1973).

Although no mutagenic effects have been associated with methyl-mercury exposure, a statistical relationship between frequency of chromosomal aberrations and blood concentration of methyl-mercury has been suggested (Skerfoing et al. 1974). The only evidence that link mercury exposure to cancer is sarcomas which were observed in rats at those tissue that had been in direct contact with metallic mercury after intraperitoneally injection of the metal (Druckrey et al., 1957).

Bioaccumulation in Aquatic Animals

The bioconcentration factor for mercury is high since uptake is fast and elimination is very slow. With brook trout, the bioconcentration factor of methyl-mercury chloride after 273 days is 23,000 for muscle, and 15,000 for whole fish (McKim et al.). A bioconcentration factor of 63,000 was obtained with fathead minnows for the same mercury compound (Olson et. al, 1975). It was suggested that the higher bioconcentration factor of 63,000 for the fathead minnow may be more representative of field situations in which are exposed to mercury via both the water and food routes (Phillips and Buhler, 1978). On the other hand, the trout were fed pelleted feed, and so there was little opportunity for food chain input to the trout. The FDA action level for mercury in fish and shellfish is 1.0 mg/kg (EPA, 1980).

Distribution and Metabolism

The disposition of mercury in the body is highly dependent upon the physical and chemical forms of this metal. Methyl-mercury compound have been demonstrated to be almost completely absorbed in the gastrointestinal tract (Miettinen, 1973). On the other hand, GI absorption of inorganic mercury by humans is less than 15 percent (Clarkson, 1971). For metallic mercury in the liquid form, less than 0.01 percent of orally administered dose is absorbed (Fribey and Nordberg, 1973). Retention of inhaled alkyl mercurial compounds is suggested to be 80% (Task Group on Metal Accumulation, 1973). Absorption data is lacking except on dogs, and is reported to be 45% (Morrow et al., 1964). Percent absorption of methyl-mercury and inorganic mercuric salts through the human skin is unknown, however, in guinea pigs, it was estimated that about five percent of a two percent solution of mercuric chloride can be absorbed through the skin (Friberg et al., 1961).

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Absorbed methyl-mercury compounds distribute readily to all tissues in the body as it can cross diffusion barriers and all membranes without difficulty. Methyl-mercury can cross the placenta and blood-brain barrier. Its target organ is the brain. About five percent of ingested methyl-mercury is deposited in the blood, with 90 percent of the methyl-mercury in blood associated with the red blood cells. The halftime of methyl-mercury in blood is about 50 days (Miettinen, 1973). The entry of methyl-mercury into the brain is delayed by a few days (Norseth and Clarkson, 1971), and amount transferred to the head region is about 10 percent of the body burden. In muscle, the mercury is usually almost entirely in the form of methyl-mercury, but in liver and kidney a substantial proportion can be present as inorganic mercury.

Mercury is accumulated in head hair after exposure to methyl-mercury compounds, with hair to blood concentration ratio of about 250 to 1 (Who, 1976). Methyl-mercury is metabolized to inorganic mercury in animal tissue (Norseth and Clarkson, 1970), and conversion to inorganic mercury is an important process in excretion in man. Excretion of methyl-mercury occurs mainly by the fecal route. Less than two percent excretion occurs in the urine. The form of mercury in feces is almost entirely the inorganic form (Turner et al., 1974) and about 90 percent of mercury in urine also inorganic (Bakir et al., 1973). The whole body halftime of methyl-mercury is about 65 days (Shahustani and Shiheb, 1974).

For mercury vapor and liquid metallic mercury, about two percent of inhaled dose is deposited in blood. The halftime in blood was estimated to be four days, accounting for at least 60 percent of the mercury deposited in the blood volume (Hurch et al., 1976). Mercury vapor, once absorbed into the bloodstream, can undergo oxidation to divalent mercury (Hg^{2+}). The red cells are an important site of this oxidation process. However, some of the dissolved mercury vapor cross rapidly into brain tissues where it is again subjected to oxidation processes. About 7 percent of the inhaled mercury is absorbed into the head region, and the halftime was found to be 21 days (Hurch et al., 1976).

About 90 percent of inhaled mercury vapor accumulates in the kidney (Rothstein and Hayes, 1964). Mercury can also be transported into the fetus after maternal exposure to mercury vapor.

About seven percent of an inhaled dose of mercury vapor was excreted in the expired air in humans, but urine and feces are the main pathways of excretion after exposure (Lovejoy et al., 1974).

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For inorganic mercury, relatively small amounts penetrate the brain or the fetus following exposure as compared to mercury vapor and alkyl mercury compounds. About 90 percent of the total burden of inorganic mercury accumulates in the kidney. Excretion in urine and feces is about 1.5 percent of the dose per day. Wholebody halftime of inorganic mercury is about 45 days.

Lead Fate and Transport

Lead is a naturally occurring element in the earth's crust. It exists in three oxidation states: the metallic (0) state, and the +2 and +4 states. In nature, lead occurs mainly as Pb²⁺, it is oxidized to Pb⁴⁺ only under strong oxidizing conditions, and few simple compounds of Pb⁴⁺ other than PbO₂ are stable (Eisler, 1988).

Lead and its compounds can be detected everywhere in the environment. In soil, the lead content from crustal rock typically ranges between 10 and 30 mg/kg (ASTDR, 1988). Levels of lead in surface water throughout the United States typically range between 5 and 30 mg/l (EPA, 1986). The average lead content of river sediment is estimated to be about 20 mg/kg (Perwak et al., 1982).

The major source of lead in the environment is atmospheric emission of organolead (tetraethyl lead and tetramethyl lead) vapors from the manufacture, transport, and handling of leaded gasoline. Atmospheric deposition is the largest source of the lead found in both soils and surface water (ASTDR, 1988). Metallic lead and common lead minerals are insoluble in water, and are usually not mobile in normal ground or surface water. These forms of lead are usually adsorbed by ferric hydroxide or combined with carbonate or sulfate ion to form insoluble compounds (Hem, 1976). In contrast, some of the lead compounds produced industrially are quite soluble in water.

O Aqueous Specification

In natural waters, lead exists mainly as the stable divalent cation or as part of an inorganic complex of low solubility with the major anions in neutral environments. These inorganic complexing agents (hydroxide, carbonate, sulfide, and more rarely sulfate) may act as a solubility control in precipitating lead from water (Callahan, 1979). In addition, a significant portion of lead in polluted water is sorbed to organic complexing agents, such as humic acid, which can maintain lead ions in a bound form at a pH as low as 3 (Guy and Chakrabarti, 1976).

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- o Sorption

Sorption processes exert important effects on the distribution of lead in the environment. Most lead is retained strongly in soil, and very little is transported into surface water or groundwater (EPA, 1986). In an aquatic system, lead is removed by adsorbing to the sediment. Almost all of the lead in the sediment is in the clay fraction (Pita and Hyne, 1975).

Under most conditions, adsorption to clay and other mineral surfaces, coprecipitation/sorption by hydrous iron oxides, and incorporation into cationic lattice sites in crystalline sediments are the main sorption processes (Callahan et al., 1979). These processes are dependent on such factors as the presence of inorganic colloids and iron oxides, ion-exchange characteristics, and the amount of lead in soil/sediment. When the pH is above 7, almost all of the lead is in the solid phase. But at lower pH, lead may be desorbed (Huang et al., 1977). In addition, release of lead from the sediment increases as the redox conditions become more oxidizing (Lu and Chen, 1977).

Biomethylation of lead by microorganisms can also release lead from the sediment. The resulting volatile compound from biomethylation, tetramethyl lead, can be either oxidized in the water column or released to the atmosphere.

Toxicity Profile - Lead

Toxicity to Aquatic Biota

Freshwater vertebrates and invertebrates are more sensitive to lead in soft water than in hard water (USEPA, 1980, 1983). At a hardness of about 50 mg/liter CaCO₃ the median effect concentration for nine families range from 140 ug/liter to 236,600 ug/liter. Chronic values for Daphnia magna and the rainbow trout are 12.26 and 83.08 ug/liter, respectively, at a hardness of about 50 mg/liter. Acute-chronic ratio calculated for three freshwater species ranged from 18 to 62. Freshwater algae show an inhibition of growth at concentrations above 500 ug/liter.

Acute values for twelve saltwater species range from 476 ug/liter for common mussel to 27,000 ug/liter for the soft shell clam. Chronic exposure to lead causes adverse effects in mysid shrimp at 37 ug/liter, but not at 17 ug/liter. The acute-chronic ratio for this species is 118.

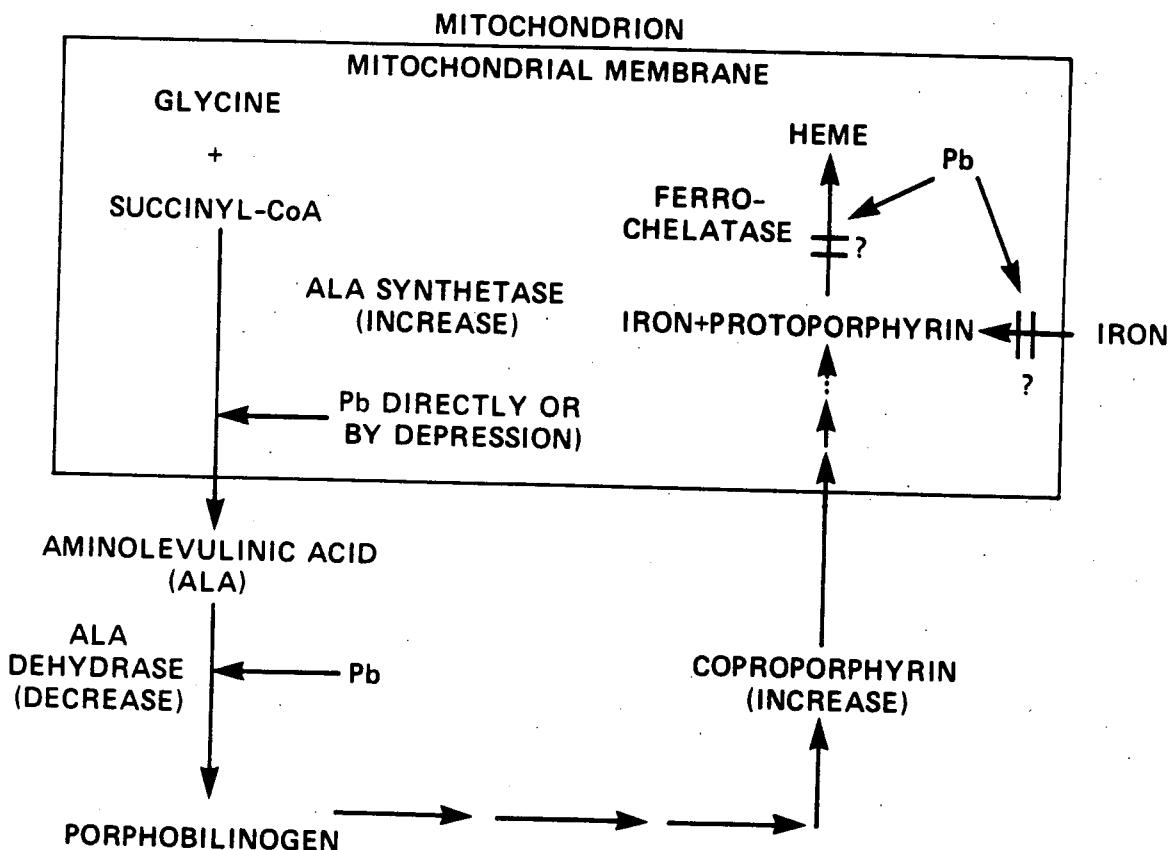
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Human Effects

Humans are usually exposed to lead by the inhalation and oral routes. Dermal exposure to lead is much less significant than exposure by inhalation or oral route. For children, the primary site of lead absorption is the gastrointestinal tract (Hammond). For dietary lead, absorption in children is about 50%. In adults, gastrointestinal lead absorption is reported to be 8% (Hammond 1982) or 15% (Chamberlain et al, 1978). Absorption of airborne lead by inhalation first involves deposition of particulate lead in the respiratory tract. The rate of deposition of particulate airborne lead in adult humans is about 30 to 50% and is modified by factors such as particulate size and ventilation rate (EPA, 1986). Once lead is deposited in the respiratory tract, its absorption is virtually complete. Dermal absorption of inorganic lead compounds is much less significant and absorption of lead acetate in cosmetic preparation applied to the skin was measured to be 0 to 0.3% in humans, and was expected to be 0.06% during normal use of such preparation (Moore, et al. 1980).

Once absorbed, lead is dispersed to three compartments in the body: blood, soft tissue, and bone. In human adults, about 95% of the total body burdens of lead is found in the bones. Of the lead distributed into blood, 99% is associated with the erythrocytes (Everson and Patterson, 1980) and over 50% of the erythrocyte lead pool is bound to hemoglobin. The amount of lead accumulated in most soft tissues such as kidney, liver and brain, with exception of renal cortex and aorta when compared with that accumulated in bones. Lead accumulated in bones can be metabolized and redistributed in the body. During physiological stress such as pregnancy and lactation, lead from maternal bone is readily distributed to the fetus (ATSDR, 1987).

The effects of exposure to lead do not depend on the routes of entry, but rather are correlated with internal exposure, usually measured as blood lead levels, at high exposure levels (blood lead levels in excess of 120 ug/dl in adults, (Kehoe, 1961) lead produces encephalopathy. The condition can be worsen to delirium, convulsions, paralysis, coma and death. High exposure levels of lead also produces gastrointestinal effects, anemia, nephropathy, electrocardiographic-abnormalities, spontaneous abortion in women and decreased fertility in men. Lower blood level (40-60 ug/dl) in adults significantly increased central and peripheral nervous system and gastrointestinal symptoms. Lower-level exposure to lead also affects the synthesis of heme, which is a constituent of hemoglobin. Lead interferes with hemebiosynthesis by altering the activity of three enzymes: delta-amino-leuvalinic acid synthetase (ALA-S), delta-amino-leuvalinic acid dehydrase (ALA-D), and ferochelatase (Figure H-2), resulting in decreased hemoglobin production. This, coupled with an increase in erythrocyte destruction, results in a hypochromic, normocytic anemia. The blood lead threshold for



SOURCE: EPA 1876a.

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FIGURE H-2

EFFECTS OF LEAD
ON HEME BIOSYNTHESIS

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decreased hemoglobin levels in children is determined to be about 40 ug/dl (WHO, 1977, EPA, 1986). In children, exposure to lead has been shown to inhibit formation of the heme-containing protein cytochrome P-450 and electron-transfer cytochromes (Saenger et al. 1984; Alvares et al. 1975). Hence, lead exposure can have pronounced effects in fundamental metabolic and energy-transfer processes. In addition, lower-level exposure to lead (blood level of 33 to 120 ug/dl) decreases the circulating level of an active form of vitamin D, 1,25 - dihydroxyvitamin D, in children (Rosen & Chesney, 1985).

This form of vitamin D is responsible for the maintenance of calcium homeostasis in the body. Blood lead level of 22 to 89 ug/dl have also been associated with suppression of immune response (Evers et al. 1982).

Effects of most concern from low-level exposure to lead are neurobehavioral impairment, IQ deficits, elevated hearing thresholds, growth retardation in infants exposed prenatally and children exposed postnatally, and the elevation of blood pressure in middle-aged men. Dose effect relationships for these effects show no indications of a threshold down to the lowest levels of internal exposure (blood lead level 10 mg/dl).

Data regarding the genotoxicity of lead compound are not conclusive. Results of mutation test in microorganisms were negative, but these tests may not be appropriate to demonstrate the mutagenicity of carcinogenic metals (EPA, 1986).

Results in mammalian test systems and in vivo studies in occupationally exposed humans were conflicting, but the data do suggest clastogenic effects (Al-Hakkak et al. 1986; Nordenson et al. 1978). Several studies have qualitatively associated oral exposure to several lead compounds with renal tumors in various species of animals (Agar et al., 1975). Data regarding the carcinogenicity of lead in humans are inconclusive.

o Bioaccumulation in Aquatic Organisms

Bioaccumulation of lead has been demonstrated for a variety of organisms, and bioconcentration factors are in the range of 100-1,000 (Maddock and Taylor, 1980; Eisler, 1977). Microcosm studies indicate that lead is not biomagnified through the food chain.

o Metabolism

Inorganic lead ion in the body is not known to be metabolized or biotransformed per se; rather, it is absorbed, distributed and then excreted (Hammond, 1982). For contrast, alkyl lead compounds are metabolized in the liver by oxidative dealkylation catalyzed by cytochrome P 450 (Jensen, 1984). In adults, about 50 to 60% of the absorbed fraction of lead was excreted, with a

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half life of 19 days. Infants have a lower total excretion rate for lead. Young children less than 2 years of age have been shown to retain 34% of the total amount of lead absorbed (Ziegler et al. 1978).

Toxicity Profile - Trichloroethylene

Trichloroethylene Fate and Transport

Trichloroethylene (TCE) is a colorless, highly volatile liquid that has been used mainly as an industrial solvent in the liquid or vapor degreasing of metal parts before finishing (Clayton, 1981). It is also used as a dry cleaning solvent, as an extractive solvent in food production, and as a chemical intermediate or solvent in the production of pesticides, waxes, gums, resins and tars (USEPA, 1975). It has found some limited application as an inhalation anesthetic and analgesic during certain short-term surgical procedures but is no longer used for these purposes in the United States (Huff, 1971).

TCE does not occur naturally in the environment. Volatilization of TCE during production and use is the major source of this compound in the environment. TCE is one of the most commonly found contaminants in groundwater (Dyksin et al. 1982). In addition, it has been detected in air, in food, and in human tissues (Pearson and McConnell, 1975).

TCE is not expected to persist in the environment. The processes that affect the transport and removal of trichloroethylene include volatilization, adsorption/desorption, and degradation.

o Volatilization

Trichloroethylene, as evidenced by its Henry's Law Constant (9.1×10^{-3} atm - m^3/mol), is volatile. In surface waters, volatilization is considered the most significant fate of TCE (Versar, 1979), and volatilization rates are dependent upon temperature, water movement and depth, associated air movement, and other factors. The volatilization half-life of TCE from a rapidly moving, shallow river (1 m deep, flowing at 1 m/s with a wind velocity of 3 m/s) has been estimated to be 3.4 h (Lyman et al. 1982). Estimated volatilization half-lives from representative environmental bodies are: pond, 11 days; lake, 4 to 12 days; and river, 1 to 12 days (EPA 1985b).

Little data are available on the volatilization rate of trichloroethylene from soil. In soil column studies, loss of TCE due to volatilization was calculated to range from 15.6 to 32.8% (Walker, 1984).

o Adsorption/Desorption

Trichloroethylene has been shown to adsorb to various soil components, including clay, humic acid, lignin and other organic matter (Garbarini, 1986).

The relationship between the amount of trichloroethylene sorbed to solid phase soils and the aqueous phase trichloroethylene concentration is often expressed as the Freundlich isotherm.

$$X/M = KC^{1/n}$$

Where X = mass of trichloroethylene sorbed (mg)

M = mass of sorbent (kg)

C = equilibrium trichloroethylene concentration
in the aqueous phase (mg/l)

K = a partition or distribution coefficient

1/n = a constant indicative of adsorptive capacity.

When 1/n = 1, the equation describes a partitioning or distribution between the two phases by a linear relationship.

The equation for the linear isotherm is

$$X/M = KC$$

This linear isotherm equation has found wide use in many soil adsorption studies, particularly at low solute concentrations.

Related to the linear partition coefficient is a coefficient K_{OC} , which is based upon the fraction of organic carbon present in the soil.

The relationship is:

$$K_{OC} = \frac{K}{f_{OC}}$$

Where f_{OC} = fraction of organic carbon in adsorbent.

Factors which have been demonstrated to influence the magnitude of K_{OC} include:

1. Octanol: Water partition coefficient (K_{OW})

K_{OC} can be estimated from K_{OW} by the following equation:

$$K_{OC} = 0.63 K_{OW} \text{ (Karickhoff, 1981)}$$

2. particle size of soil

Since adsorption is a surface phenomenon, the extent of adsorption should be directly related to the surface area of the adsorbent (soil), which in turn is related to particle size. (Karickhoff, 1979; Schwabenbach, 1981).

3. Organic Carbon Content of Soil

Experimentally measured trichloroethylene partition coefficient values (K_{OC}) have been reported to range from 58.1 to 155.8 l/kg for soils of differing chemical composition (Walker, 1984, Seip et al., 1986; Garbarini and Lion, 1986), indicating high soil mobility. Significant movement of trichloroethylene in soil was also demonstrated in a field study when trichloroethylene was observed to infiltrate rapidly from river water into groundwater (Schwabenbach, 1983).

o Degradation

a. Chemical degradation

The primary transformation process for trichloroethylene in the atmosphere is reaction with sunlight-produced hydroxyl radicals (Singh et al. 1982). The half-life of trichloroethylene was estimated to be 6.8 days, and the degradation products of this reaction was reported to include phosgene, dichloroacetyl chloride, and formyl chloride (Atkinson, 1985). On the other hand, trichloroethylene in water can resist hydrolysis at 100°C (Drilling et al. 1975). USEPA reports that under normal condition, TCE is not hydrolyzed in water (USEPA, 1979). In addition, oxidation and photolysis are not environmentally important processes for trichloroethylene in water. (Callahan et al., 1979).

b. Biodegradation

Biodegradation of trichloroethylene occurs under anaerobic conditions in soil. The primary product is 1,2 - dichloroethylene (with the cis isomer preferred over the trans isomer), and with small amounts of vinyl chloride production (Kleopfer, 1985).

Aquatic Biota

o Acute Toxicity

The acute toxicity values for two freshwater cladocerans, Daphnia magna and Daphnia pulex are 64,000 and 45, 000 ug/l,

respectively (USEPA, 1980). Fathead minnow and bluegill 96-hour LC₅₀ values ranged from 40,700 to 66,800 ug/l. When the fathead minnow was exposed to trichloroethylene for 96 hours at a concentration of 21,900 ug/l, 50 percent of the test organisms developed loss of equilibrium. Of the saltwater species tested, there were signs of erratic swimming, uncontrolled movement, and loss of equilibrium after several minutes of exposure to 2,000 ug/l. (USEPA, 1980).

o Chronic Toxicity

No studies have been conducted concerning the chronic toxicity of trichloroethylene to freshwater or saltwater species.

Human Effects

The major routes of trichloroethylene exposure are inhalation or ingestion from water or food. Dermal exposure is relatively insignificant during normal industrial use (Sato and Nakajiima, 1979). Trichloroethylene is readily absorbed via all routes of exposure. Retention of inhaled TCE has been estimated to range from 28 to 74 percent (Monster et al, 1976). In rats, at least 80 percent of ingested TCE was absorbed (Daniel, 1963). Once absorbed, TCE moves to all body tissues. It crosses the blood-brain barrier, producing its anesthetic effect, as well as the placental barrier. The principal targets for inhaled trichloroethylene are the central nervous system (CNS), liver, kidney, and hematological system. An inhalation LC₅₀ (lowest lethal concentration) for humans of 2900 ppm has been reported (NIOSH, 1984). The action of trichloroethylene primarily involved the central nervous system, although some effects were also observed in the gastrointestinal and circulatory system. The threshold for CNS effects in humans is in the range of 81-110 ppm (Nomiyama and Nomiyama, 1977; Salvini et al., 1971). CNS symptoms include drowsiness, headache, vertigo, tremor, nausea, fatigue, vomiting, a feeling and appearance of lightheadness, increasing to unconsciousness, and in some cases, to death. In addition to this general narcotic effect, specific paralysis of the trigeminal nerve was also reported (Pearson, 1934). Cardiac arrhythmia, increased respiratory rate (tachypnea), decreased alveolar ventilatory amplitude, hepatic and renal injury (relatively infrequent) (Joron et al, 1950) were also observed. For oral exposure, a single 7,000 mg/kg dose of trichloroethylene is lethal to humans (Sorgo, 1976).

As shown in animal studies, the principal target organs due to oral exposure include the liver, kidney, and immunological system. Acute toxic effects include increased liver weight, decreased hematocrit, and depressed cell-mediated immune response (Tucker et al., 1982, Sanders et al., 1982). Chronic exposure of humans to highly elevated levels of trichloroethylene results primarily in neurological and

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neuropsychiatric symptoms, consisting of tremors, giddiness, increased lacrimation, reddening of skin, decreased sensitivity of the hands, alcohol intolerance, neuroanesthetic syndrome with anxiety states, bradycardia, and insomnia (Bardodej and Vyskocil, 1956). Inhalation studies with rodents indicate that trichloroethylene is fetotoxic but not teratogenic (Healy et al., 1982). Data from genotoxicity studies of humans occupationally exposed to trichloroethylene have been inconclusive, although a significant increase in sister chromatid exchange in some exposed workers has been reported (Gu et al., 1981).

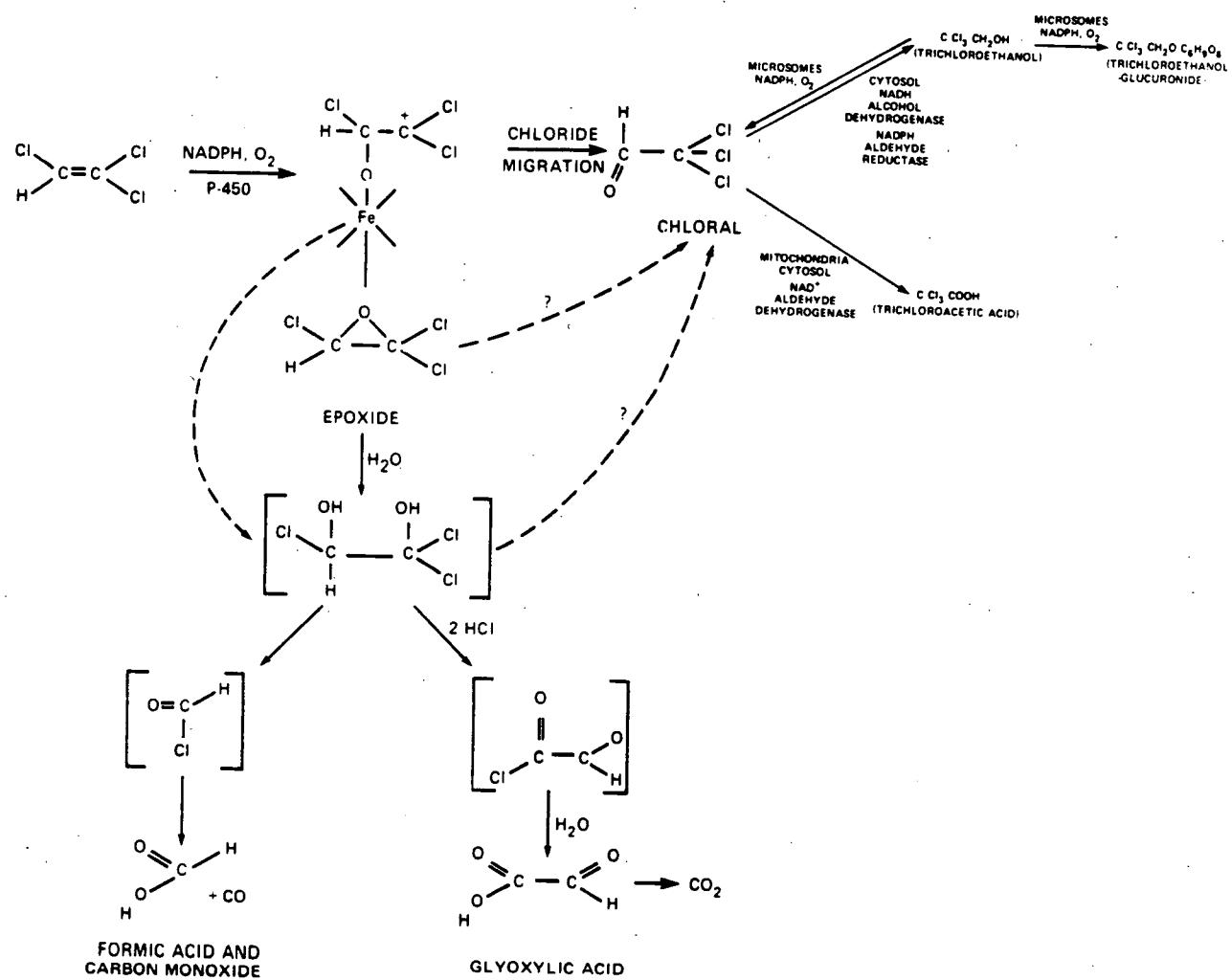
Although available epidemiological studies are inadequate to associate trichloroethylene exposure with increased cancer risk, the carcinogenicity of trichloroethylene has been demonstrated in animal studies in both inhalation and oral routes. Observed tumors include Leydig cell tumors, lung adenoma, hepatoma, renal adenoma after exposure for 104 weeks (rats) or 78 weeks (mice) by inhalation route to 100, 300 or 600 ppm trichloroethylene. (Maltoni et al., 1986). In an NCI (1976) bioassay, significantly increased incidence of hepatocellular carcinoma occurred in B6C3F, mice were observed after oral dose of 1169 or 2339 mg/kg/day by gavage 5 days/week for 78 weeks.

- o Bioaccumulation in Aquatic Animals

The bioconcentration factor for the bluegill was studied using radiolabeled trichloroethylene, and was reported to be 17 (US EPA, 1978) after 14 days. The tissue half-life was less than one day. There is no evidence for biomagnification of trichloroethylene in aquatic food chains.

- o Metabolism and Biotransformation

Trichloroethylene is rapidly metabolized in the body to trichloroethanol, trichloroethanol-glucuronide, and trichloroacetic acid. The hypnotic agent, chloral hydrate, was also recently demonstrated to result from trichloroethylene metabolism in humans (Cole et al., 1975). In addition, other minor metabolites, such as monochloroacetic acid (Soucek and Vlachova, 1960) and N-(hydroxyacetyl) aminoethanol (Dekant et al., 1984) have been demonstrated in trichloroethylene-exposed humans. These metabolites are excreted in urine, and in less significant quantities by other excretion routes, such as the bile. The half-time for renal elimination of trichloroethanol and trichloroethanol-glucuronide is about 10 hours after TCE exposure (Nomiyama and Nomiyama, 1971), whereas the half-time of renal elimination of trichloroacetic acid produced during trichloroethylene exposure approximates 52 hours (range 35 to 70 hours).



SOURCES: MILLER AND GUENGERICH, 1982; IKEDA et al, 1980.

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FIGURE H-3

POSTULATED SCHEME FOR THE METABOLISM OF TRICHLOROETHYLENE

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Inhaled doses of trichloroethylene are metabolized rapidly in humans. The percentage of the dose metabolized has been reported between 40 and 75% of the retained dose (Nomiyama and Nomiyama, 1971, 1977; Sato et al., 1977; Monster et al., 1979). The principal site of trichloroethylene metabolism is the liver. Other tissues, such as kidney, spleen, and small intestine may also metabolize TCE, as these tissues have been shown to be sites of cellular protein binding of metabolites from TCE (Bolt and Fisher, 1977; Stott et al., 1982).

In vitro studies with liver cell fraction have shown the initial biotransformation of trichloroethylene involves metabolism to chloral hydrate and formation of trichloroethylene epoxide (see Figure H-3). The formation of chloral/epoxide is the rate-limiting step in the metabolism of TCE (Ikeda et al., 1980; Nomiyama and Nomiyama, 1979).

Intramolecular rearrangement with migration of chlorine atoms is presumed to occur in the formation of chloral hydrate, in order to explain the formation of trichloroethanol and trichloroacetic acid. The formation of trichloroethylene epoxide is not proposed to be an essential first step in the metabolism of trichloroethylene (Miller and Guengrich, 1982), and trichloroethylene epoxide was reported not to play a major role in the macromolecular binding which usually results in toxicity and carcinogenicity of a compound. This may explain the lower than predicted mutagenic and carcinogenic potential of trichloroethylene.

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APPENDIX I

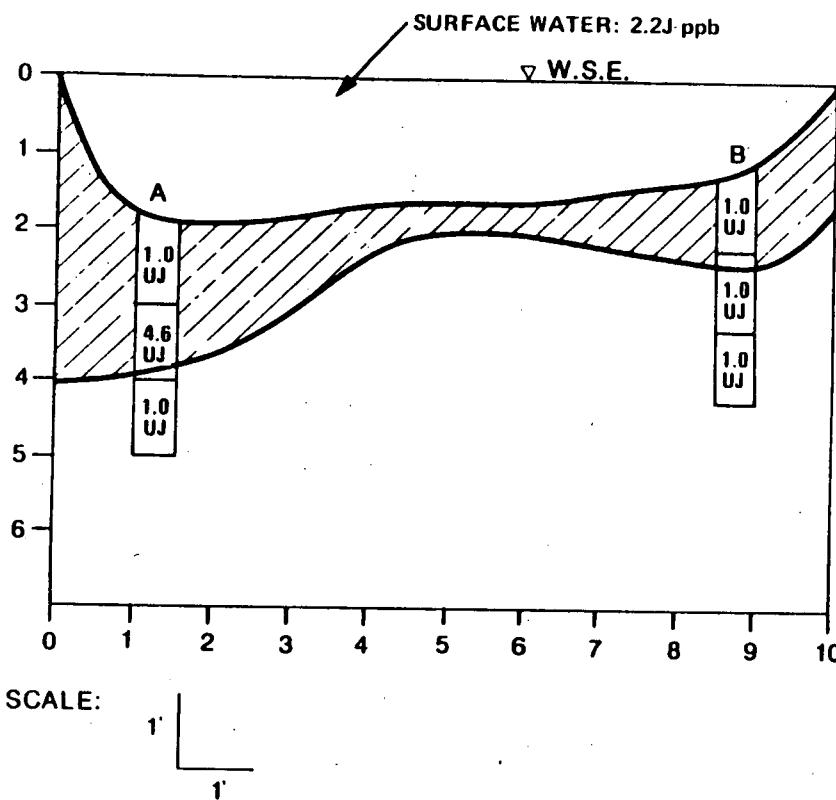
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APPENDIX I
SURFACE WATER AND SEDIMENT
STATION CROSS-SECTIONS
AND ARSENIC RESULTS

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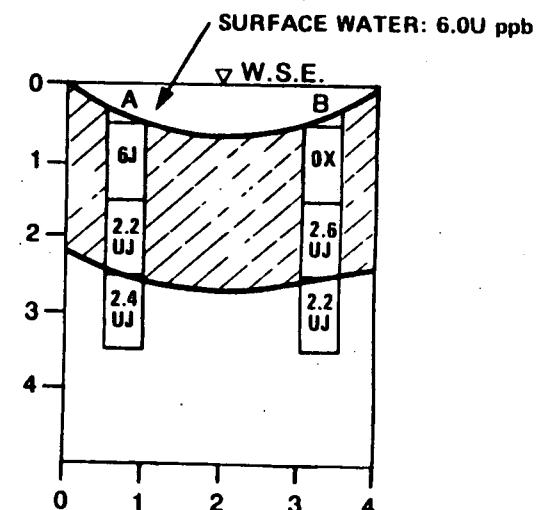
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STATION ER-0A (BLACKWATER BRANCH)



(STAGNENT; Q=0)

* STATION ER-0B (PINE BRANCH)



* NOTE: ASSUME WATER DEPTH AT EACH pt.. NO FLOW CALCULATIONS.

KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

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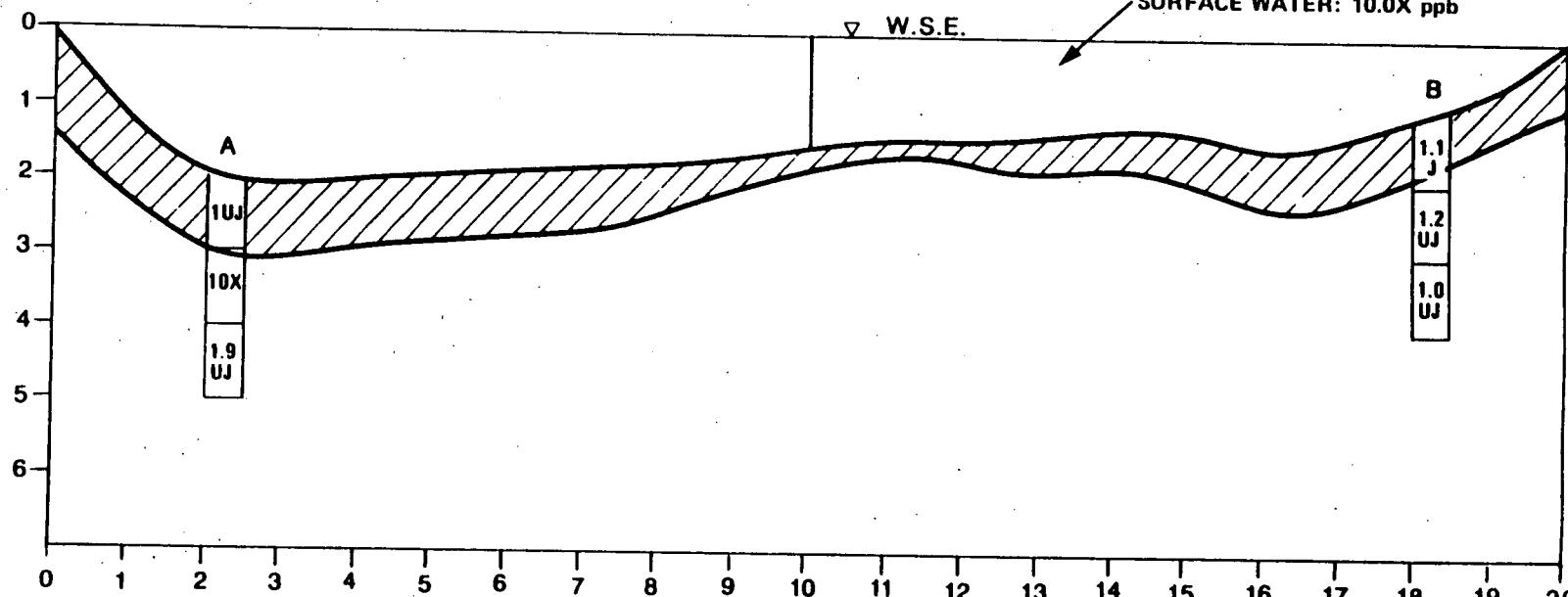
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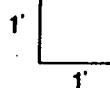
FIGURE I-1

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATIONS ER-0A (BLACKWATER BRANCH)
AND ER-0B (PINE BRANCH)

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SCALE:



KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- - SEDIMENT IN STREAM BED

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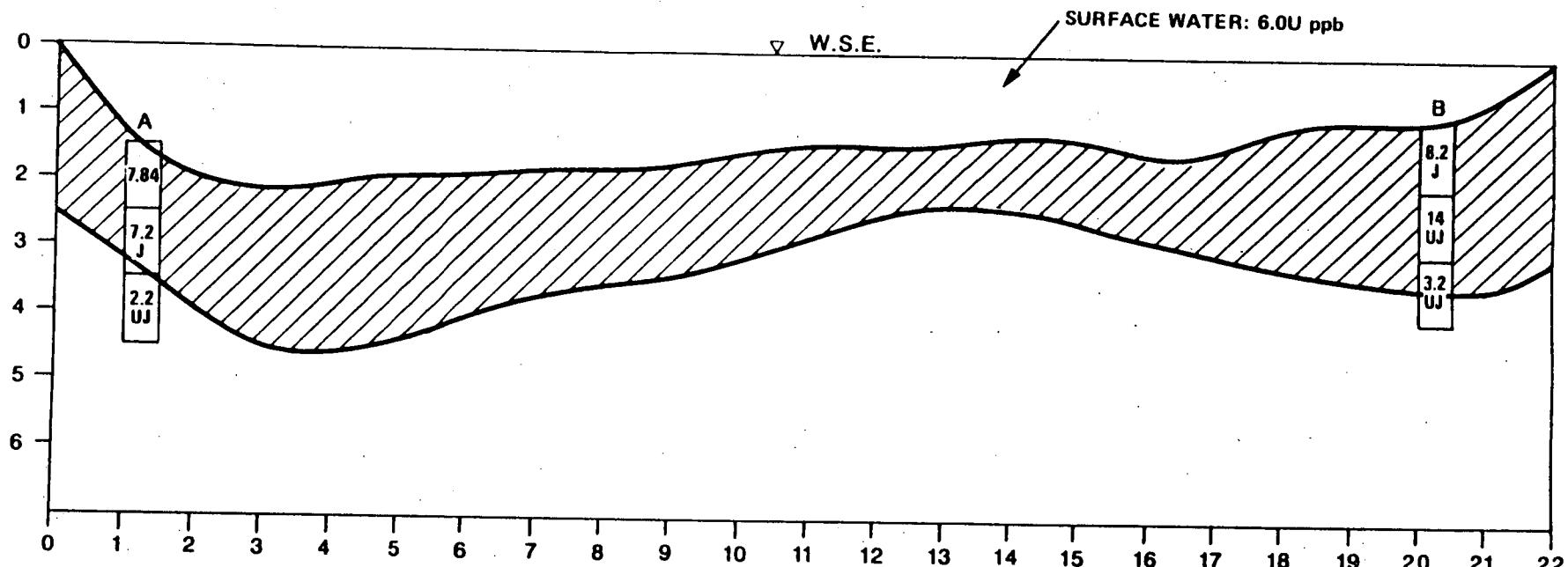
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FIGURE I-2

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-0 (BLACKWATER BRANCH)

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NOTE: ASSUMED THAT STREAM CROSS-SECTION IS SIMILAR TO STATION ER-0

KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U - UNDETECTED
- | | - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

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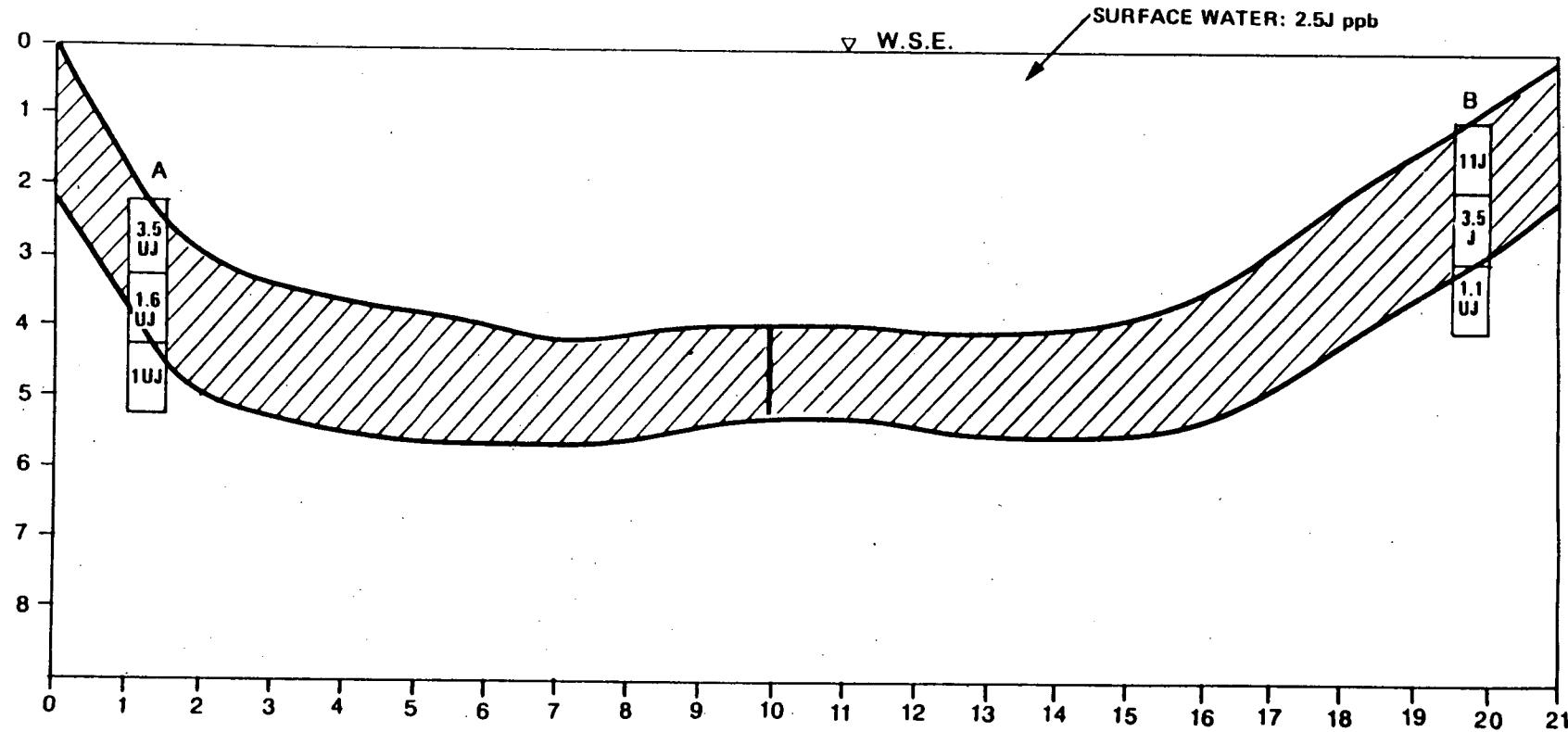
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FIGURE I-3

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-1 (BLACKWATER BRANCH)

EBASCO SERVICES INCORPORATED



NOTE: ASSUMED THAT CROSS-SECTION IS SIMILAR TO STATION ER-4

KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U = UNDETECTED
- || = ESTIMATED VALUE
- J = VALUE BETWEEN CRDL AND IDL
- X = REJECTED DATA

0771

106T 200 VIN ED

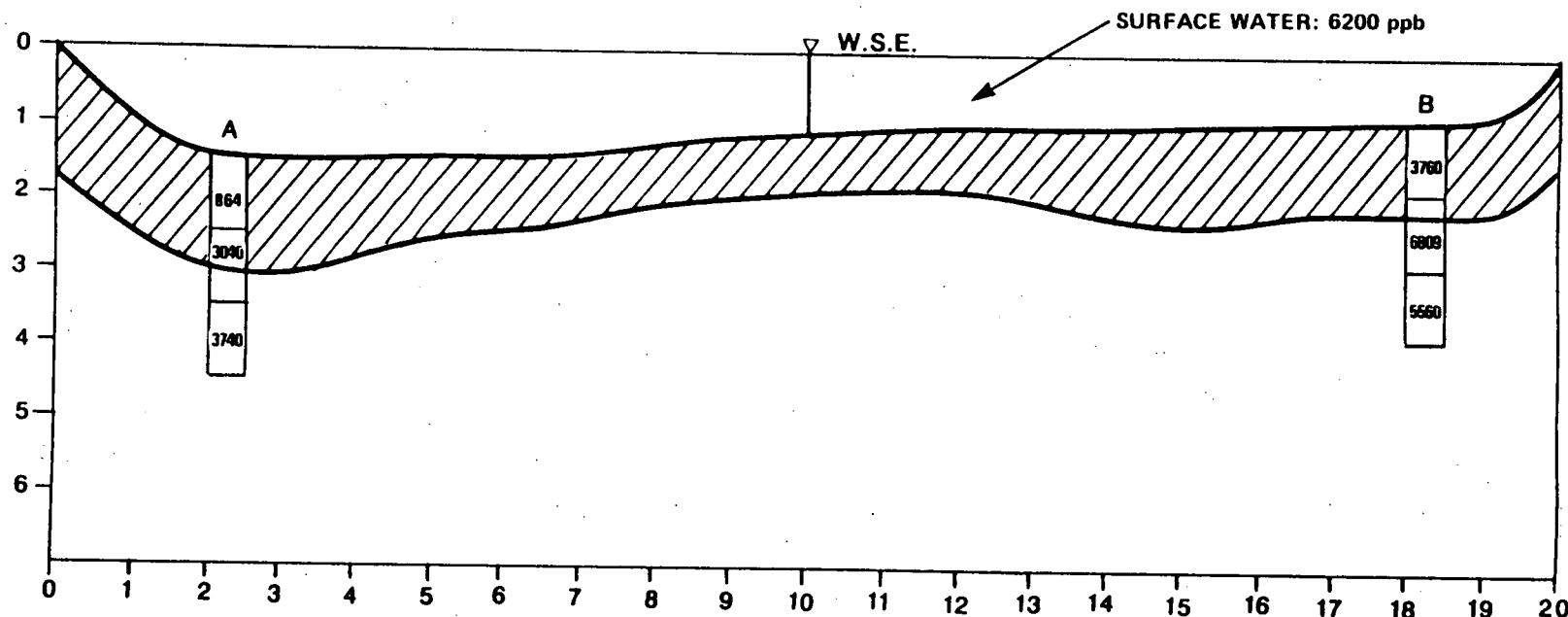
U.S. ENVIRONMENTAL PROTECTION
AGENCY

VINELAND CHEMICAL COMPANY SITE

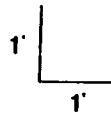
FIGURE I-4

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-2 (BLACKWATER BRANCH)

EBASCO SERVICES INCORPORATED



SCALE:



KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- / / / - SEDIMENT IN STREAM BED

890T 200 NIA

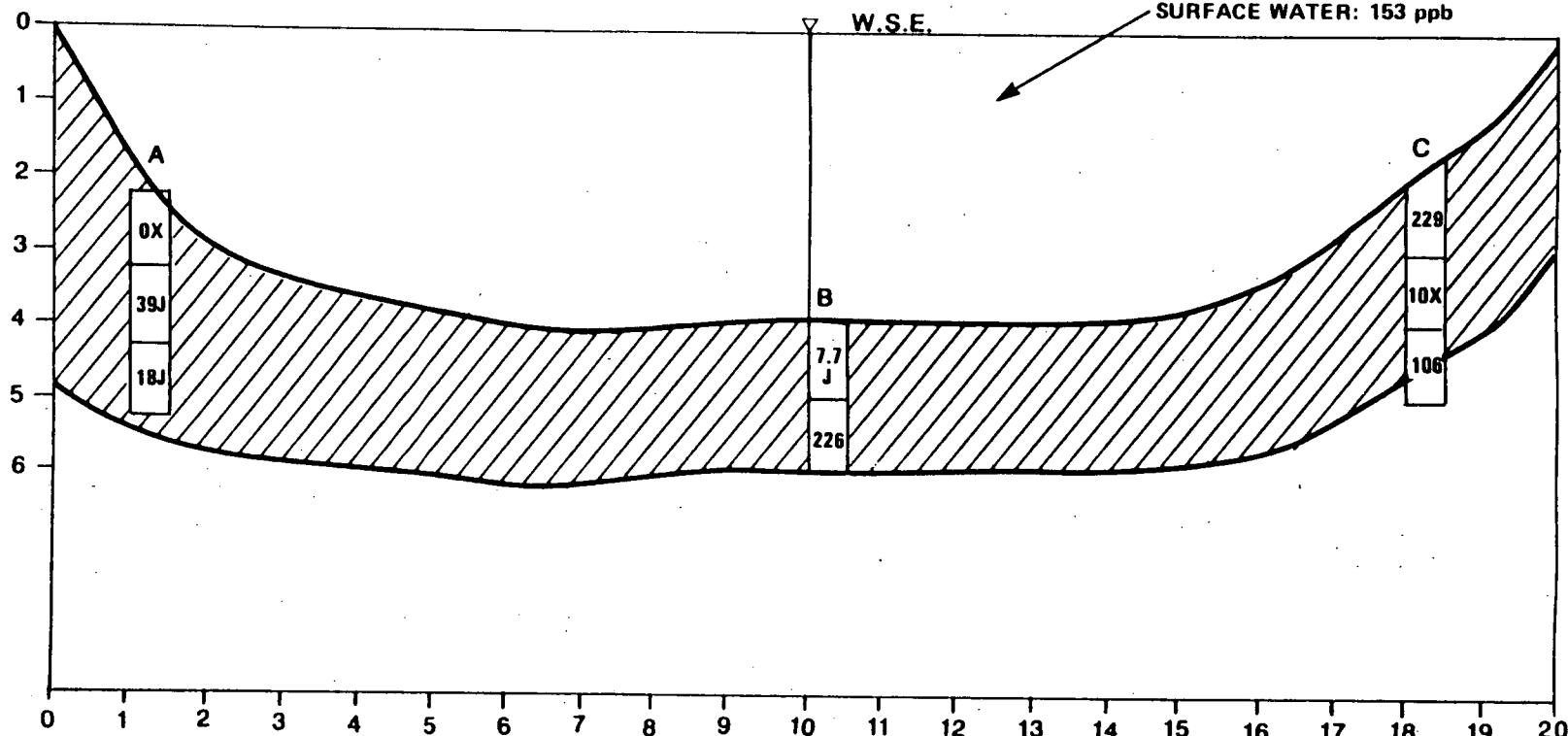
U.S. ENVIRONMENTAL PROTECTION
AGENCY

VINELAND CHEMICAL COMPANY SITE

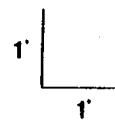
FIGURE I-5

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-3A (BLACKWATER BRANCH)

EBASCO SERVICES INCORPORATED



SCALE:



KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U = UNDETECTED
- [] = ESTIMATED VALUE
- J = VALUE BETWEEN CRDL AND IDL
- X = REJECTED DATA

1069T 200 VIA IN STREAM BED

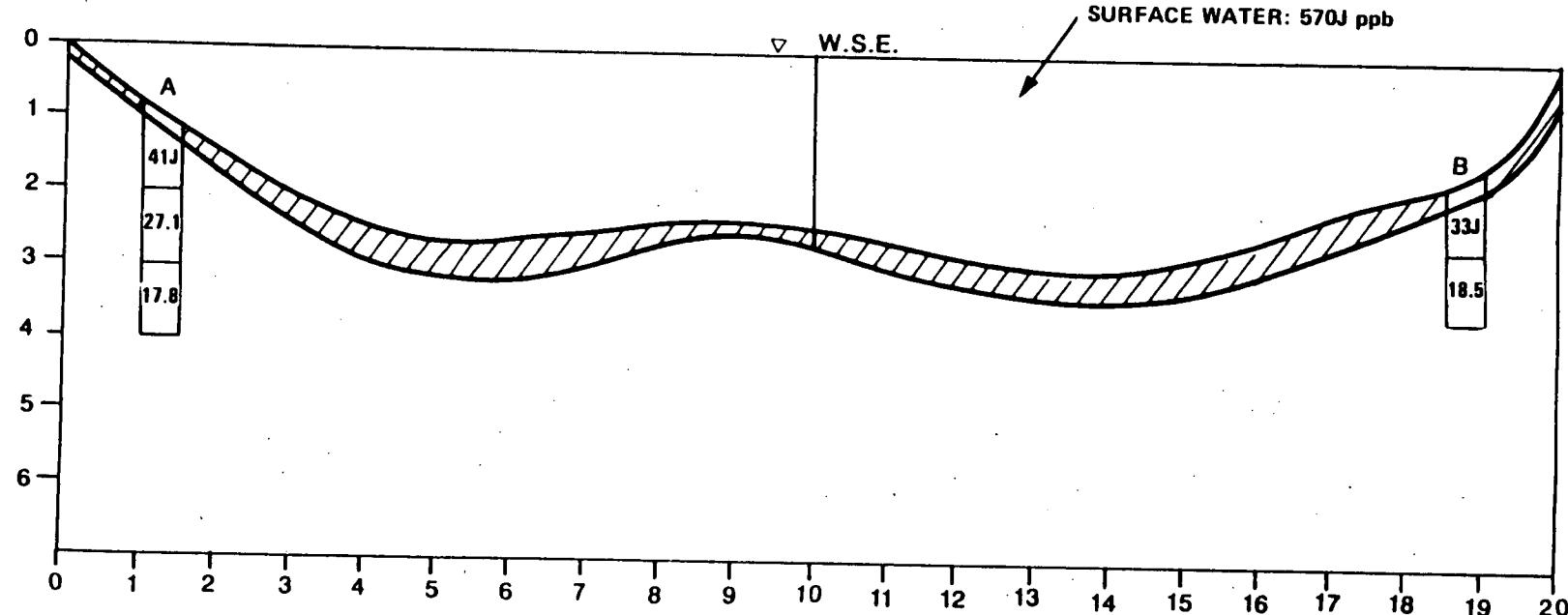
U.S. ENVIRONMENTAL PROTECTION AGENCY

VINELAND CHEMICAL COMPANY SITE

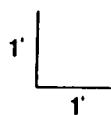
FIGURE I-6

SURFACE WATER AND SEDIMENT ARSENIC RESULTS
STATION ER-4 (BLACKWATER BRANCH)

EBASCO SERVICES INCORPORATED



SCALE:



KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

STREAM BED
VIN 002 1070

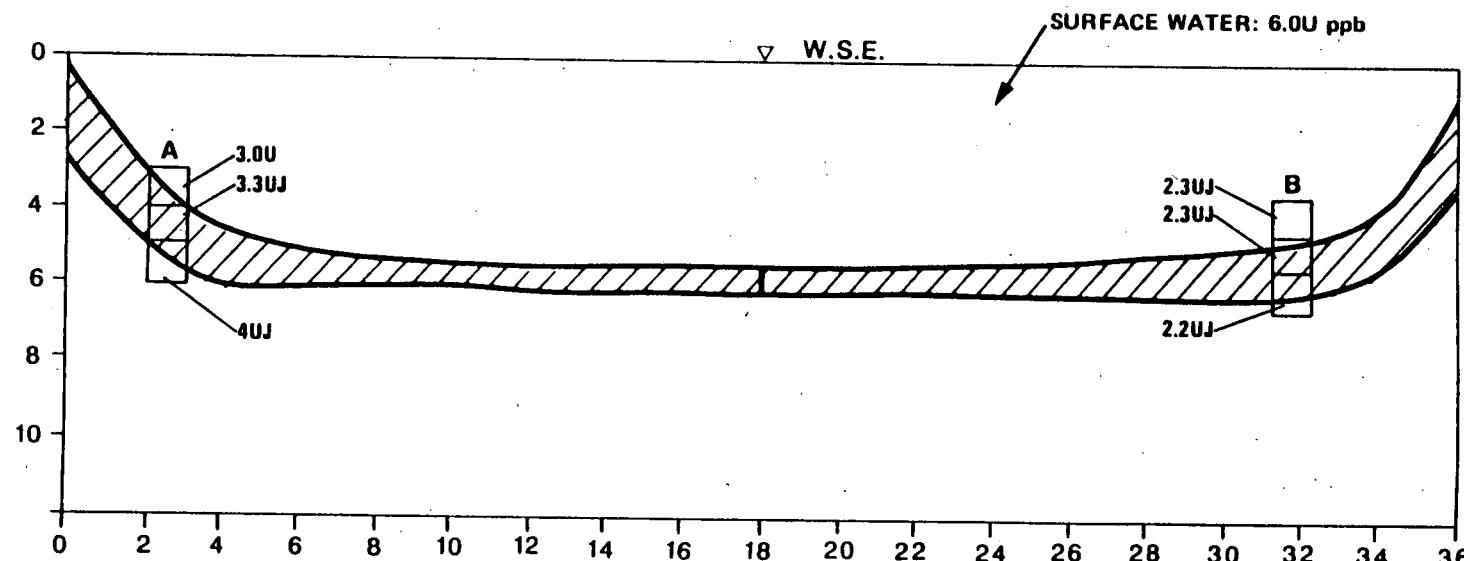
U.S. ENVIRONMENTAL PROTECTION
AGENCY

VINELAND CHEMICAL COMPANY SITE

FIGURE I-7

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-5 (BLACKWATER BRANCH)

EBASCO SERVICES INCORPORATED



KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

1071 100 ZOO NIA

'N STREAM BED

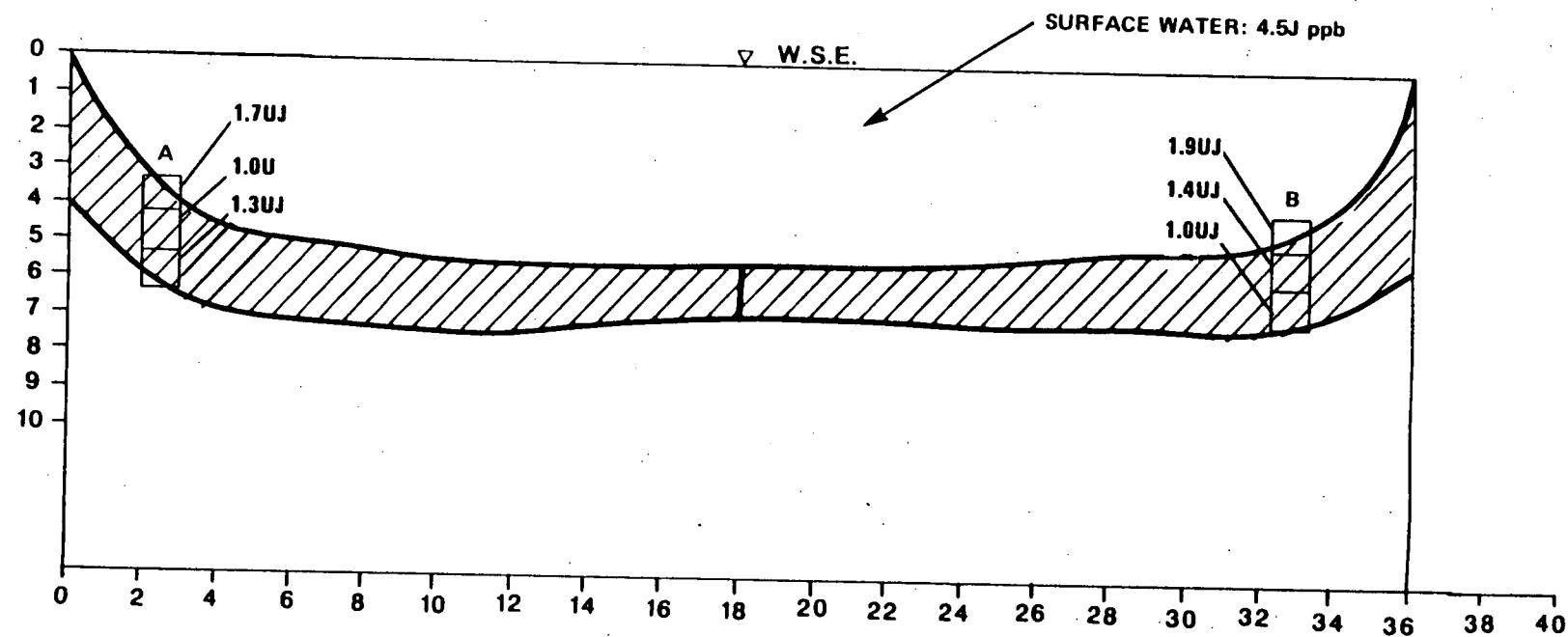
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FIGURE I-8

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-6 (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- /// - SEDIMENT IN STREAM BED

VIN 002 1072

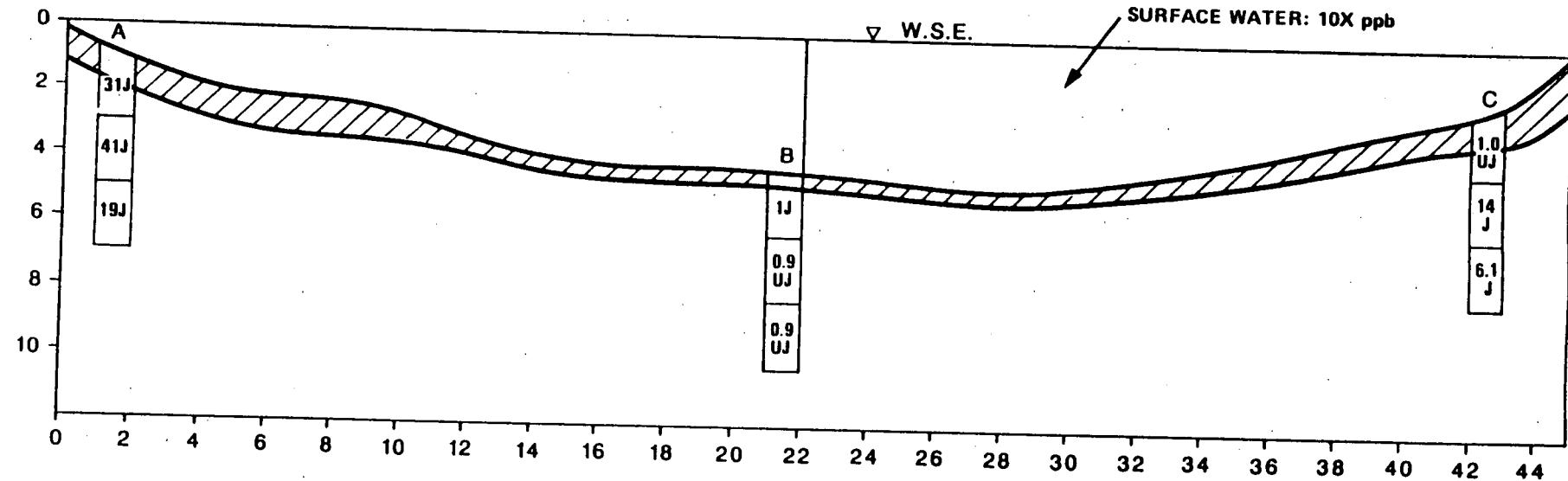
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AGENCY

VINELAND CHEMICAL COMPANY SITE

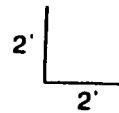
FIGURE I-9

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-6A (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

----- IN STREAM BED
1073 200 VIN

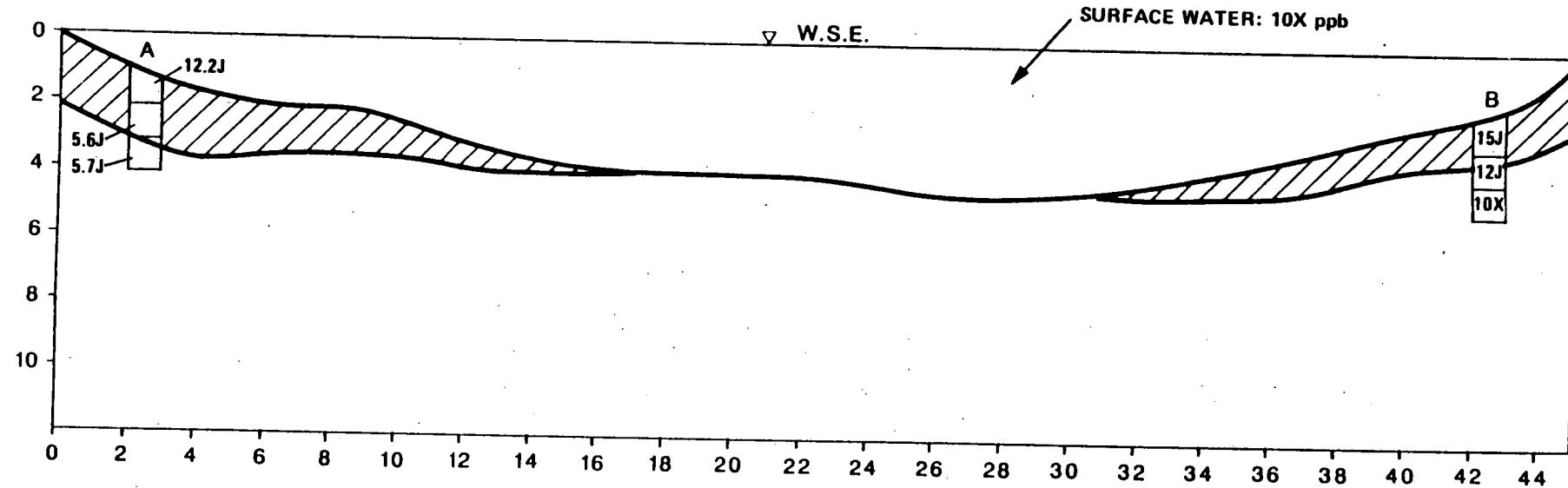
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AGENCY

VINELAND CHEMICAL COMPANY SITE

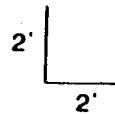
FIGURE I-10

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-7 (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



NOTE: ASSUMED THAT STREAM X-SECTION IS SIMILAR TO STATION ER-7

KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- J - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

M BED
VIN 002 1074

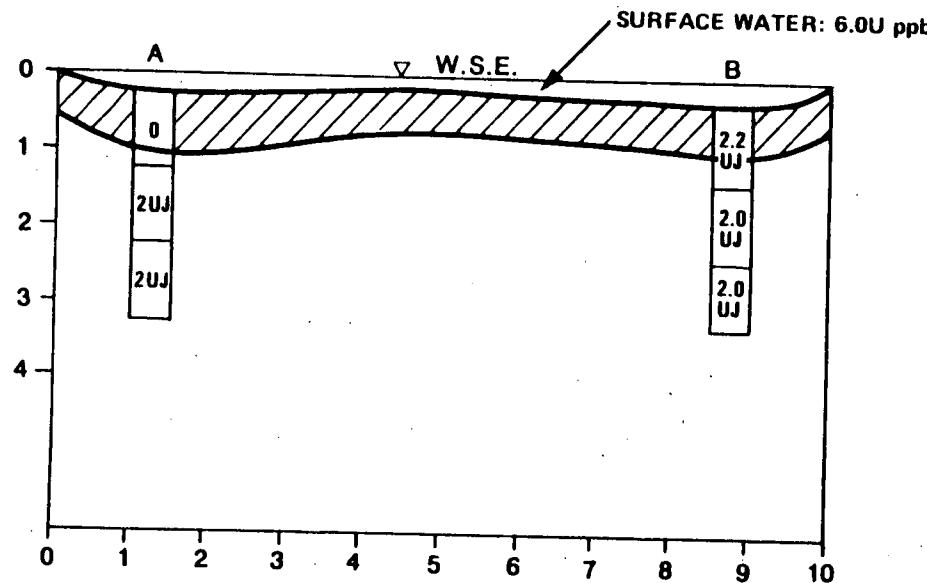
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VINELAND CHEMICAL COMPANY SITE

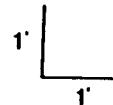
FIGURE I-11

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-8 (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- / / / - SEDIMENT IN STREAM BED

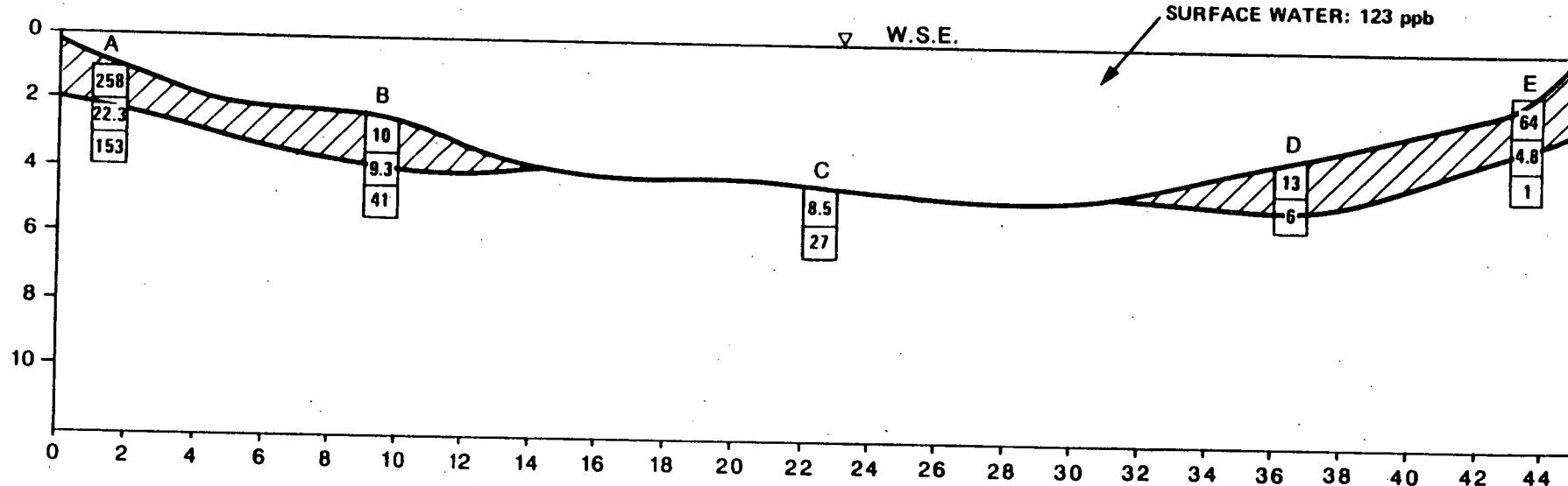
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VINELAND CHEMICAL COMPANY SITE

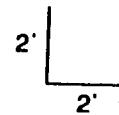
FIGURE I-12

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-9 (LITTLE ROBIN BRANCH)

EBASCO SERVICES INCORPORATED



SCALE:



NOTE: ASSUMED THAT STREAM CROSS-SECTION IS SIMILAR TO STATION ER-7

KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

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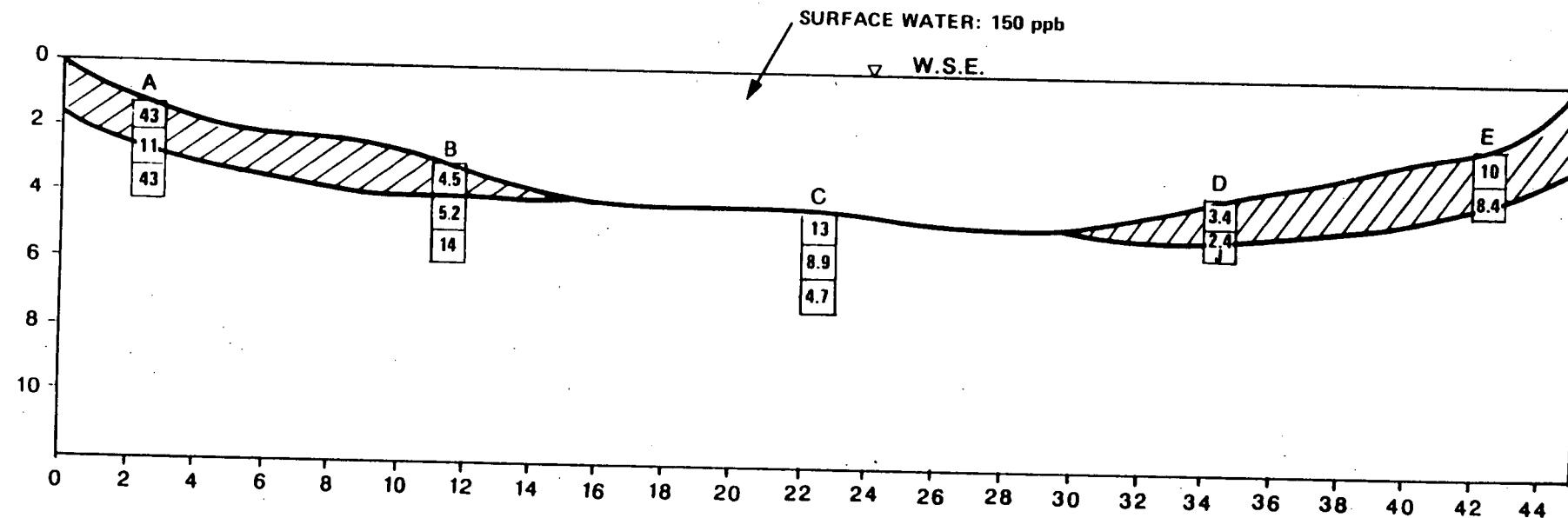
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AGENCY

VINELAND CHEMICAL COMPANY SITE

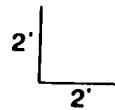
FIGURE I-13

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-9A (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



NOTE: ASSUMED THAT STREAM CROSS-SECTION IS SIMILAR TO STATION ER-7

KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- () - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

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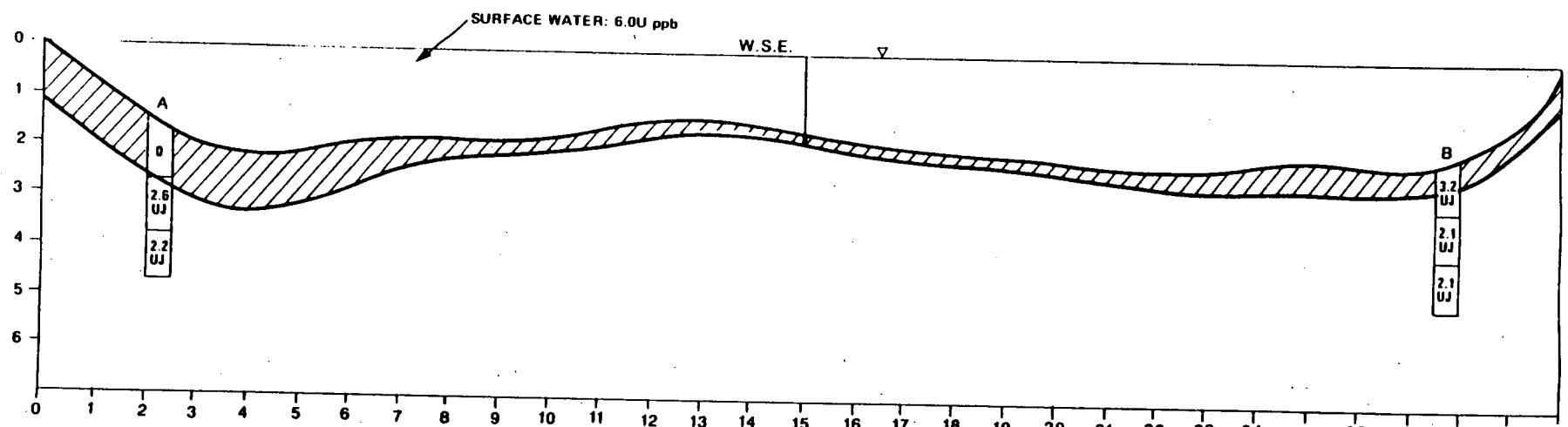
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VINELAND CHEMICAL COMPANY SITE

FIGURE I-14

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-9C (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- SEDIMENT IN STREAM BED

VIN 020 1078

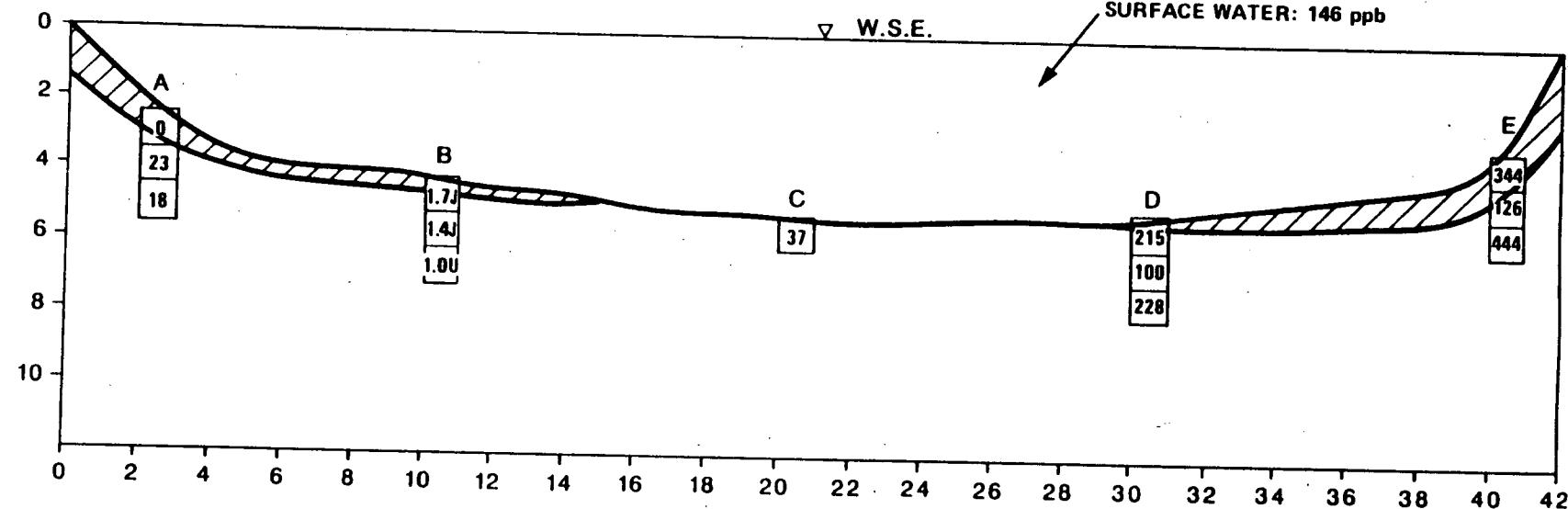
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VINELAND CHEMICAL COMPANY SITE

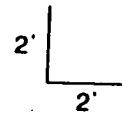
FIGURE I-15

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-9D (MUDDY RUN)

EBASCO SERVICES INCORPORATED



SCALE:



NOTE: ASSUMED THAT STREAM CROSS-SECTION IS SIMILAR TO STATION ER-10

KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- / - SEDIMENT IN STREAM BED

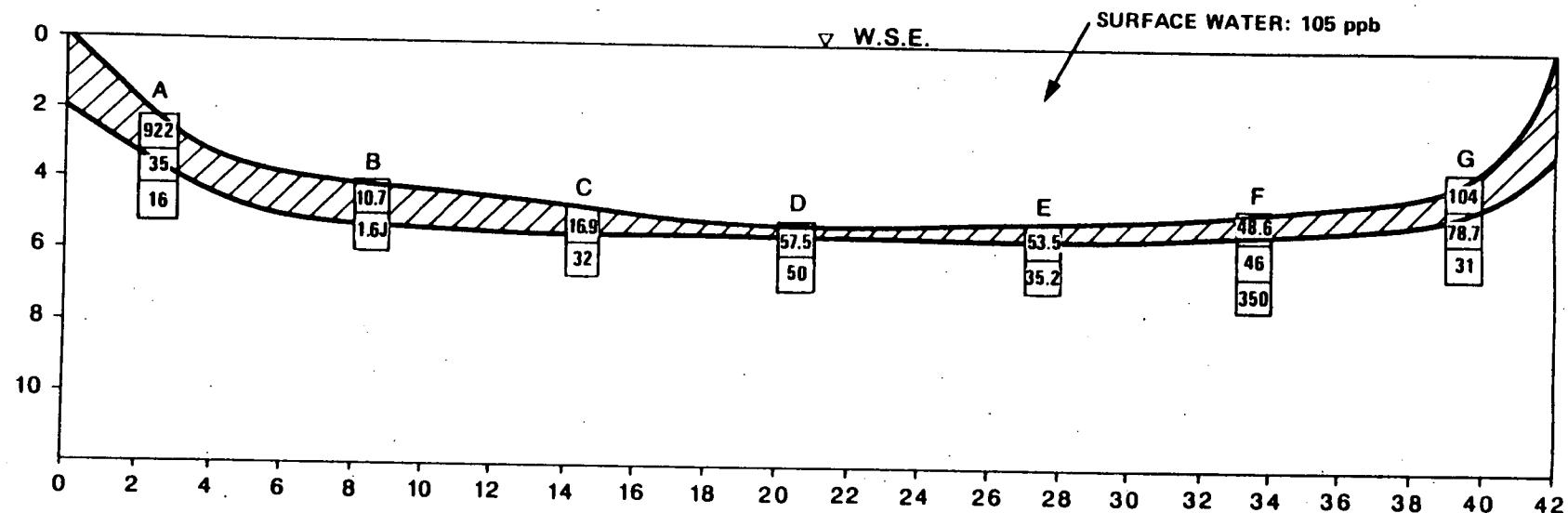
U.S. ENVIRONMENTAL PROTECTION
AGENCY

VINELAND CHEMICAL COMPANY SITE

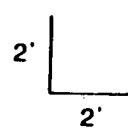
FIGURE I-16

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-9E (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



NOTE: ASSUMED THAT STREAM CROSS-SECTION IS SIMILAR TO STATION ER-10

KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U = UNDETECTED
- [] = ESTIMATED VALUE
- J = VALUE BETWEEN CRDL AND IDL
- X = REJECTED DATA
- 077A = STREAM BED

0808 200 NIA

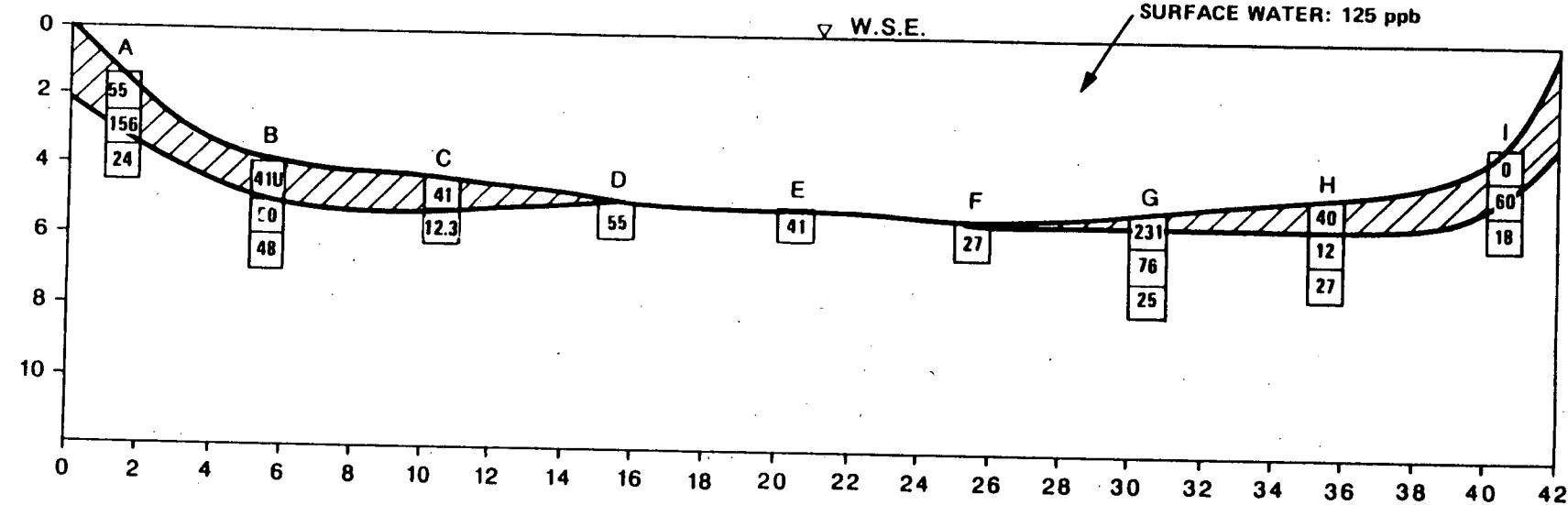
U.S. ENVIRONMENTAL PROTECTION
AGENCY

VINELAND CHEMICAL COMPANY SITE

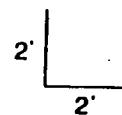
FIGURE I-17

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-9F (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



NOTE: ASSUMED THAT STREAM CROSS-SECTION IS SIMILAR TO STATION ER-10

KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- I - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA

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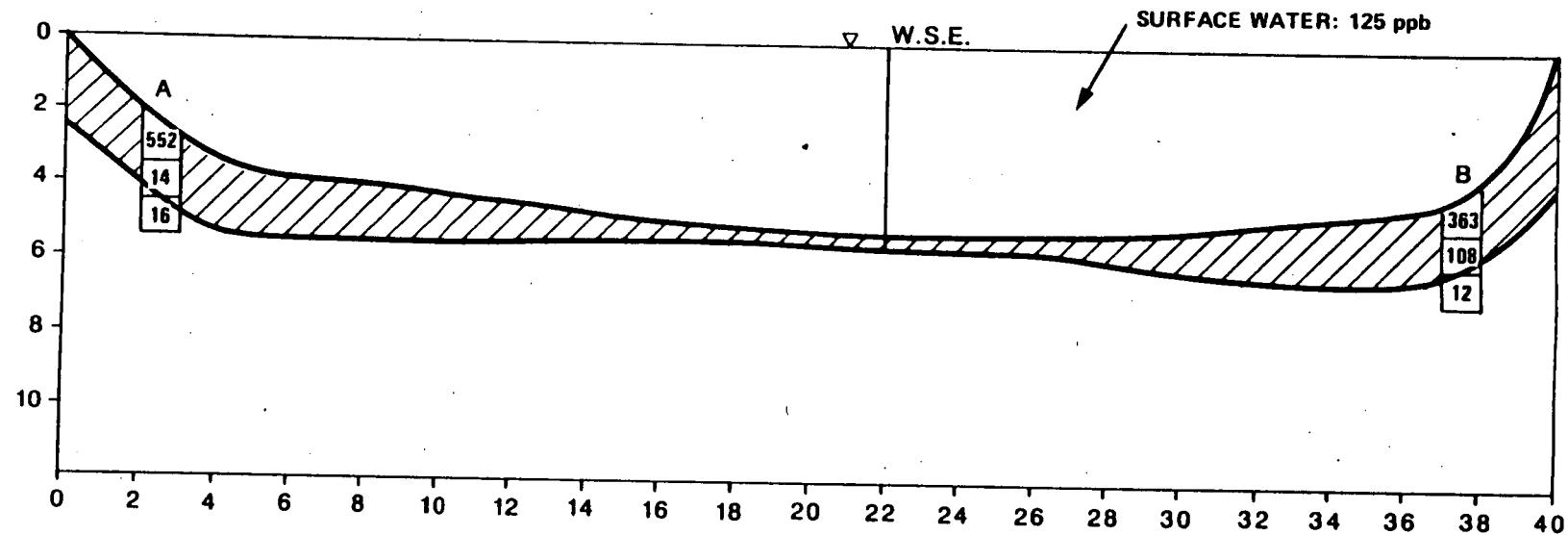
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VINELAND CHEMICAL COMPANY SITE

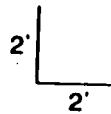
FIGURE I-19

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-10A (MAURICE RIVER)

EBASCO SERVICES INCORPORATED



SCALE:



KEY:

- SURFACE SEDIMENT [AS]: ppm
- SURFACE WATER [AS]: ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- / / / - SEDIMENT IN STREAM BED

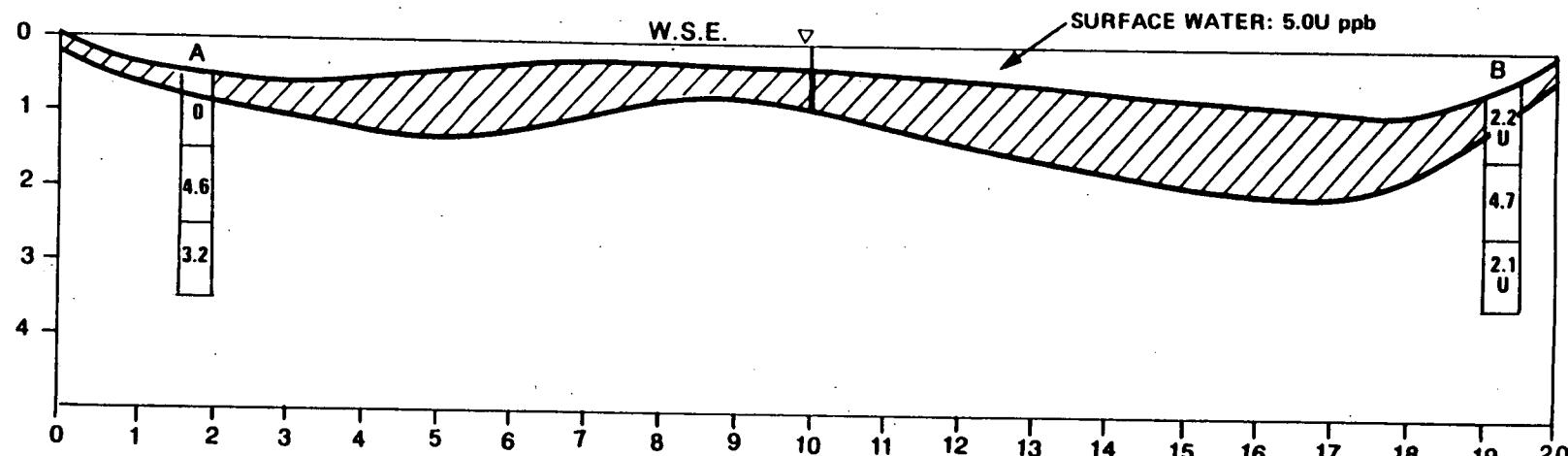
U.S. ENVIRONMENTAL PROTECTION
AGENCY

VINELAND CHEMICAL COMPANY SITE

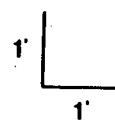
FIGURE I-18
SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-10 (MAURICE RIVER)

EBASCO SERVICES INCORPORATED

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SCALE:



KEY:

- SURFACE SEDIMENT (AS): ppm
- SURFACE WATER (AS): ppb
- U - UNDETECTED
- [] - ESTIMATED VALUE
- J - VALUE BETWEEN CRDL AND IDL
- X - REJECTED DATA
- - SEDIMENT IN STREAM BED

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AGENCY

VINELAND CHEMICAL COMPANY SITE

FIGURE I-20

SURFACE WATER AND SEDIMENT
ARSENIC RESULTS
STATION ER-11 (TARKILIN BRANCH)

EBASCO SERVICES INCORPORATED

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APPENDIX J.

**VINELAND SEDIMENT ANALYSES:
GRAINSIZE AND CHEMICAL PARAMETERS**

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APPENDIX J.

VINELAND SEDIMENT ANALYSES: GRAINSIZE AND CHEMICAL PARAMETERS

OBJECTIVE

Determine the functional relationship among and within chemical and grainsize parameters from [i] the Blackwater Branch, [ii] the Upper Maurice River and [iii] the Lower Maurice River.

METHOD

The analytical sequence, applied to each of the three tributary/river sections was a three-step process. Results presented in each of the three following sections [for the three sections] follow the analytical sequence which is described as follows:

1. Distribution Evaluation

The distribution of the 7 parameters [arsenic, iron, total organic carbon chemical parameters and greater than sand, sand, clay and silt grainsize parameters] for each section of the tributary/river system was determined by histogram displays of all observations within each section. Variables were transformed as required to normalize distributions to the extent possible.

2. Correlation Coefficient Matrix

The matrix of correlation coefficients for the 7 parameters [all possible variate pairs] in each of the three tributary/river sections was generated using a statistical program, STATGRAPHICS, version 2.1 [distributed by STSC Corporation, Chicago IL]. Of primary interest are [i] the relationship between individual chemical parameters and specific grainsizes, [ii] the relationship among the three chemical parameters and [iii] the inter-relationship of grainsize classes, particularly as these relationships may account for either [i] or [ii]. Each of these three relationships is discussed in light of the individual tributary/river segment results.

3. Draftsman Plot Display

Draftsman plot[s] were generated in STATGRAPHICS to graphically display significant correlation results in each of the three tributary/river section correlation matrices.

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DEFINITIONS

Correlation Matrix: matrix of correlation coefficients for all possible pairings of variables in a dataset. A correlation coefficient is a measure of the interdependence between two variates. The coefficient is a pure number, ranging from -1 to 1, indicating the 'direction' of the correlation. [IE: If the correlation is -1, high values in one of the variates are associated with low values in the second variate. If the correlation is +1, high and/or low values coincide in the two variates.] An intermediate value of zero indicates the absence of correlation but not necessarily the lack of interdependence between the two. Typically, a correlation matrix will contain the absolute value of the correlation coefficient, the sample size and the statistical significance of the value of the coefficient of the bottom half of the matrix. [The diagonal of the matrix is +1.000, because the correlation of a variate to itself is perfectly positive. The two possible correlation coefficients of variates X and Y, X^*Y and Y^*X , have the same value. Therefore, the top and bottom halves of the matrix, above and below the diagonal are mirror-images of the same values.]

The hypothesis tested by the statistical test is: $r = 0$, where 'r' is the correlation coefficient of the two variates. Rejection of the null hypothesis implies that correlation exists. Depending upon the value of the correlation coefficient and the number of observations [n] represented in the calculation of the coefficient, the null hypothesis is rejected [or not rejected] at various levels of uncertainty. Statistically speaking, the null hypothesis is rejected or cannot be rejected at a set 'alpha level'. Rejecting at a specific alpha-level means that the probability of falsely rejecting the null hypothesis [due to chance observations] is limited to that alpha-level. For example, a specific correlation coefficient with fixed n may be significant at alpha = 0.10 but not significant at alpha = 0.05. The correlation is weaker as the alpha level increases, indicating that the probability of having falsely rejected the null hypothesis is higher [IE, at alpha = 0.05, the probability of falsely rejecting the null hypothesis is 5%. At alpha = 0.10, the probability is 10%].

The matrix cells in the correlation matrices presented for the Blackwater Branch and the Upper and Lower Maurice River indicate the direction of the correlation [top line of the cell] and the alpha-level for the associated correlation coefficient and sample size [bottom line of the cell]. For significant correlations, relative strength of the relationship is indicated by comparing the correlation

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coefficients. The larger the absolute value of the coefficient [with fixed n], the stronger the correlation. These comparisons are summarized below the matrix in each exhibit.

Normal Distribution: The continuous frequency distribution of an infinite range, based on an explicit function dependent upon the mean and standard deviation. The Normal distribution is conventionally known as 'the bell curve', the Gaussian and/or LaPlacean distribution. Many conventionally applied parametric statistical tests assume the underlying distribution is normal. However, many environmental variables are distributed log-normally [ie, the log transformed variate values exhibit the typical shape of a Normal distribution]. While most statistical tests are 'robust' to data which do not meet this assumption, it is good practice to transform obviously non-normal distributions to approach the Normal.

Draftsman Plot: The draftsman plot is a graphical analogue to the correlation matrix. The matrix columns and rows exhibit all possible pairs. However, rather than correlation coefficients, matrix entries are bivariate scatter plots for all possible pairs of variates. In the following results sections, draftsman plots are generated to graphically display significant results from the correlation analyses for each of the three tributary/river sections.

RESULTS AND DISCUSSION

The following subsections summarize analytical results for the Blackwater Branch, the Upper Maurice River and the Lower Maurice River, respectively.

BLACKWATER BRANCH

Results

1. Distribution Evaluation

Sixty-five observations were reported from Blackwater Branch sediment stations for each of the seven variables: As [mg/kg], Fe [mg/kg], TOC [mg/kg], >SAND [% composition], SAND [%], CLAY [%] and SILT [%]. The three chemical parameters required a log transform [base e] to normalize the observations. While the grainsize parameters are not perfectly normal, conventional transformations [log and arcsine] did not substantially improve the distributions. These 65 observations included sediments both upstream and downstream of the Vichem Site. The upstream samples contained negligible concentrations of arsenic. To partition more effectively the interactions between contaminants and grainsize, a subset of downstream samples [n=21] was

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analyzed separately. Removal of the low-concentrations of arsenic did not substantially improve the normality of the raw data. Consequently, the natural log transform of the chemical data was retained in these analyses.

2. Correlation Matrix

Exhibit J-1 displays the correlation matrix for the 65 observations from the Blackwater Branch sediment stations, indicating the direction of the correlation [first line per cell] and the associated alpha-level for rejecting the null hypothesis: $r = 0$, where r = the correlation coefficient. As described above, the diagonal of the lower triangle of the matrix is composed of positive-correlations [coded '+'] with alpha-levels of 0.0000, indicating the positive correlation of a vector on itself. Conventionally, 'statistical significance' is defined as an alpha value lying between 0.00 and 0.05. For purposes of differentiating the strongest relationships, that level is selected as a cut-off in the following discussion.

Significant correlations between the grainsize classes and the three chemical parameters are as follows:

Ln As was positively correlated with both clay and silt. The relationship is slightly stronger between ln As and clay [than between ln As and silt].

Ln Fe correlated positively with both silt and clay. Similar to the As correlations, the relationship between clay and iron was slightly stronger than between silt and iron. Iron was negatively correlated with sand.

Ln TOC, like ln Fe, correlated positively with silt and clay; negatively with sand.

No significant correlation between the grainsize class 'greater than sand' and any of the log-transformed chemical parameters was found.

Correlations between the three possible pairings of the three chemical parameters are:

[Ln As and ln TOC] and [ln Fe and ln TOC] each exhibited a positive correlation at statistically significant levels [$0.00 < \alpha < 0.05$].

Ln As*ln Fe exhibited a negative correlation which was not statistically significant [$\alpha > .05$].

Independent of the chemical data, the following correlations between the six possible pairings of the four grainsize classes [ie, >sand*sand, >sand*clay, >sand*silt, sand*clay, sand*silt, clay*silt] were significant:

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EXHIBIT J-1

BLACKWATER BRANCH: CORRELATION MATRIX 1
[N=64]

<u>CLAY</u>	<u>LN AS</u>	<u>LN FE</u>	<u>LN TOC</u>	<u>GT SAND</u>	<u>SAND</u>
<u>SILT</u>					
LN AS	+ .0000				
LN FE	- .8877	+	.0000		
LN TOC	+- .0000	+- .0009	+- .0000		
GT SAND	-+ .2410	+.0972	+.9333	+.0000	
SAND	- - .1780	-.0000	-.0000	-.0001	+.0000
CLAY	++ .0025	+.0000	+.0000	-.6194	-.0000 .0000
SILT	++ .0362	+.0001	+.0002	-.1709	-.0000 .0000 .0000

STRENGTH OF SIGNIFICANT [alpha < 0.05] CORRELATIONS

RELATIVE MAGNITUDE: CLAY*TOC > CLAY*FE > CLAY*AS
 CORRELATION COEFFICIENT: 0.62 > 0.48 > 0.37

RELATIVE MAGNITUDE: SILT*FE > SILT*TOC > SILT*AS
 CORRELATION COEFFICIENT: 0.47 > 0.45 > 0.26

RELATIVE MAGNITUDE: SAND*FE > SAND*TOC
 CORRELATION COEFFICIENT: /-0.58/ > /-0.49/
 WHERE: / / INDICATES ABSOLUTE VALUE

RELATIVE MAGNITUDE: AS*TOC > FE*TOC
 CORRELATION COEFFICIENT: 0.61 > 0.40

1 MATRIX CELL ENTRIES:

TOP LINE = DIRECTION OF CORRELATION
 BOTTOM LINE = ALPHA LEVEL OF SIGNIFICANCE OF CORRELATION
 [-1.0 < ALPHA < 1.0]
 FOR EXAMPLE, THE DIRECTION OF THE CORRELATION OF LN ARSENIC ON LN ARSENIC IS POSITIVE. THE ALPHA LEVEL OF SIGNIFICANCE IS 0.0000; IE, THERE IS A PERFECT 1:1 RELATIONSHIP

VINTAGE 1990

Sand exhibited statistically negative correlations with each of the other three grainsize classes.

Clay and silt correlated positively [at: $0.00 < \alpha < 0.05$].

Separate analysis of sediment samples downstream of the Vichem site resulted in slightly different relationships [Exhibit J-2]. Clay and sand still correlated positively with As, Fe and TOC [with the clay relationship being stronger]. Sand correlated negatively with all three of the chemical parameters [including As]. However, overall the contaminated sediment samples, the relationship between As*TOC and Fe*TOC were stronger and there was a significant relationship between As*Fe.

3. Draftsman Plot

Exhibit J-3 graphically displays the outstanding features of the correlation matrix from the subset of Blackwater Branch sediment samples downstream from the Vichem Site. The display plots those variates exhibiting the strongest inter-relationships observed: clay and sand vs ln arsenic, ln iron and ln TOC.

Discussion

Data trends apparent in Exhibits J-1 through J-3 are consistent with documented arsenic chemistry [Section 5.1]. That is, arsenic correlates positively with factors governing its absorption to sediment particles, specifically: TOC, iron and clay/silt. The positive association with iron is associated with ferric hydroxide matrices. The correlation with silt and clay fractions of the grainsize analysis is attributable to the increased surface area associated with these fractions. The increased surface area provides additional sites for organic carbon and ferric hydroxide absorption which, in turn, absorb arsenic.

Sand and/or greater than sand represent the remainder of the grainsize partitions. Relative to clay and silt, sand fractions have relatively low surface area per unit mass. Negative correlations between these grainsize fractions with both TOC and iron are expected and, consequently, negative correlations with arsenic, as observed.

UPPER MAURICE RIVER

Results

1. Distribution Evaluation

Distributions of chemical and grainsize parameters were comparable to those observed in the data from the Blackwater Branch. Log transforms of the chemical data and raw percent composition per grainsize class were used throughout the analyses of the upper Maurice River data.

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EXHIBIT J-2
BLACKWATER BRANCH [DOWNSTREAM OF VICHEM SITE]: CORRELATION MATRIX 1
[N = 21]

	<u>LN AS</u>	<u>LN FE</u>	<u>LN TOC</u>	<u>GT SAND</u>	<u>SAND</u>
<u>CLAY</u>	<u>SILT</u>				
LN AS	+ .0000				
LN FE	+ .0100	+ .0000			
LN TOC	+ .0000	+ .0083	+ .0000		
GT SAND	+ .7113	+ .3368	+ .1539	+ .0000	
SAND	- .0065	- .0045	- .0004	- .0897	+ .0000
CLAY	+ .0008	+ .0046	+ .0003	+ .9967	- .0000 + .0000
SILT	+ .0315	+ .0280	+ .0290	- .4671	- .0000 + .0000 + .0000

STRENGTH OF SIGNIFICANT [alpha < 0.05] CORRELATIONS

RELATIVE MAGNITUDE: CLAY*TOC > CLAY*AS > CLAY*FE
CORRELATION COEFFICIENT: 0.71 > 0.68 > 0.59

RELATIVE MAGNITUDE: SILT*FE = SILT*TOC > SILT*AS
CORRELATION COEFFICIENT: 0.48 = 0.48 > 0.47

RELATIVE MAGNITUDE: SAND*TOC > SAND*FE > SAND*AS
CORRELATION COEFFICIENT: /-0.70/ > /-0.60/ >/-0.57/
WHERE: / / INDICATES ABSOLUTE VALUE

RELATIVE MAGNITUDE: AS*TOC > FE*TOC > AS*FE
CORRELATION COEFFICIENT: 0.83 > 0.56 > 0.55

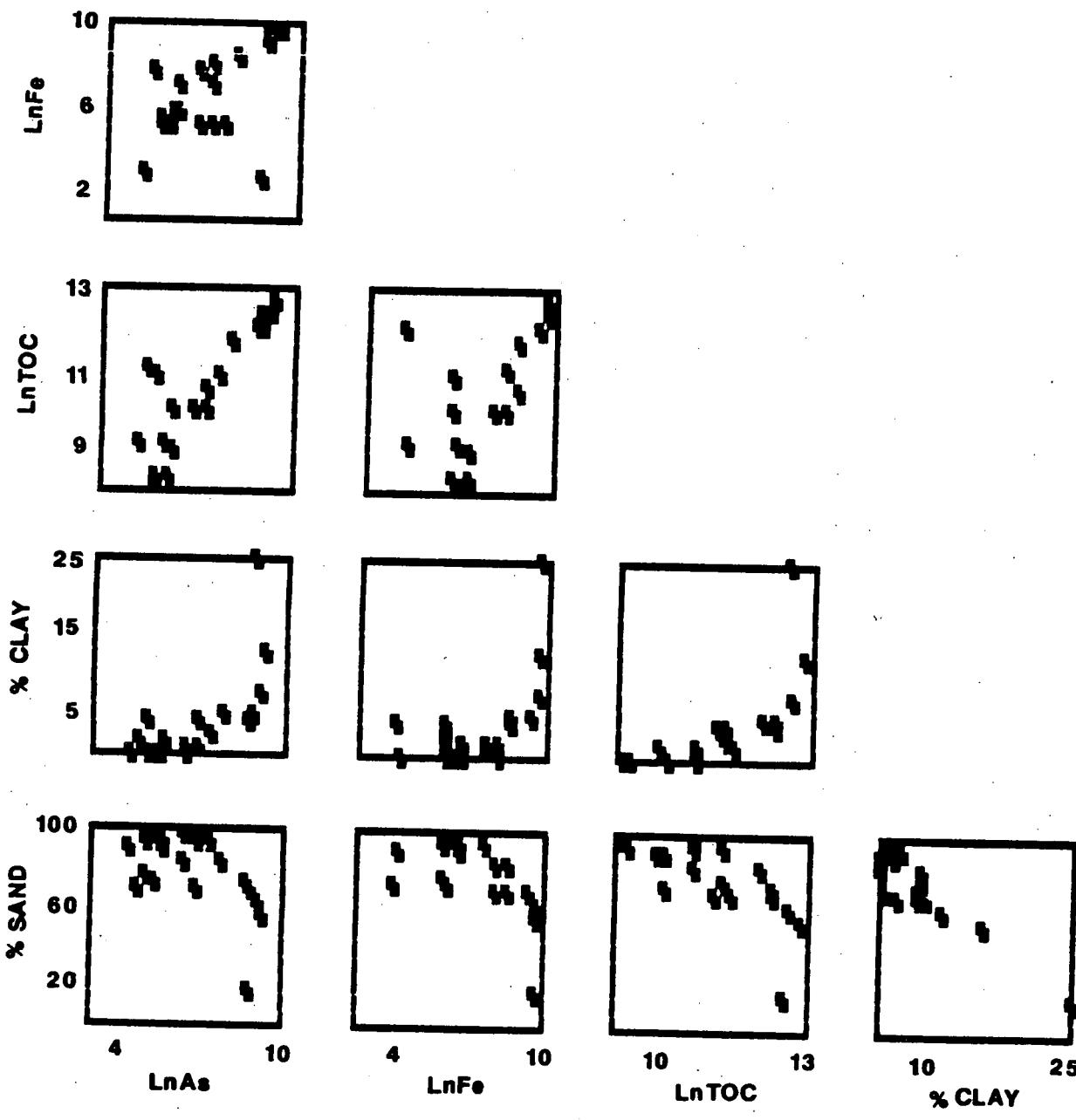
1 MATRIX CELL ENTRIES:

TOP LINE = DIRECTION OF CORRELATION

BOTTOM LINE = ALPHA LEVEL OF SIGNIFICANCE OF CORRELATION

[-1.0 < ALPHA < 1.0]

FOR EXAMPLE, THE DIRECTION OF THE CORRELATION OF LN ARSENIC ON LN ARSENIC IS POSITIVE. THE ALPHA LEVEL OF SIGNIFICANCE IS 0.0000; IE, THERE IS A PERFECT 1:1 RELATIONSHIP



U.S. ENVIRONMENTAL PROTECTION AGENCY
VINELAND CHEMICAL COMPANY
EXHIBIT J-3
BLACKWATER BRANCH (DOWNSTREAM OF VICHEM SITE): CLAY & SAND VS As/Fe/TOC
EBASCO SERVICES INCORPORATED

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2. Correlation Matrix

Exhibit J-4 presents the direction of correlation [+ vs -] and the alpha level associated with the correlation coefficient at which the null hypothesis can be rejected.

Significant correlations of specific chemicals with specific grainsize classes are as follows:

The class 'greater than sand' correlated negatively with ln TOC and positively with ln arsenic. The relationship was stronger between > sand and ln TOC.

Sand correlated negatively with both ln As and ln Fe; the relationship with arsenic being negligibly stronger.

Clay and silt both correlated positively with all three chemical parameters: ln As, ln Fe and ln TOC. The relative magnitude of the relationships was stronger with clay over all three parameters. Within a grainsize, the relative strength of the correlations was similar for clay and silt: ln TOC > ln FE > ln As.

Ln-transforms of the chemical parameters exhibited strong positive correlations across all three possible pairings. The relative strength [independent of grainsize class was:
ln As*ln Fe > ln Fe*ln TOC > ln As*ln TOC.

The following correlations between grainsize classes, independent of chemical parameters were statistically significant [$0.00 < \text{alpha} < 0.05$]:

Sand correlated negatively with all other grainsize classes. Clay and silt were significantly correlated.

The data set from the upper Maurice River includes both river samples and samples from tributaries feeding the river. The relationships described above for the entire data set corresponded to the results from a secondary analysis, delimited to river sediment samples. The directions of significant correlations were consistent for both the entire data set and the data set containing only river samples. However the strength of the relationships increased with removal of the uncontaminated tributary samples.

3: Draftsman Plot

Exhibits J-5 displays the draftsman plots for the ln-transformed chemical parameters against clay. Clay is displayed [rather than silt] because it exhibited the stronger relationships with the chemical parameters overall.

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EXHIBIT J-4
UPPER MAURICE RIVER: CORRELATION MATRIX 1
[N=140]

	<u>LN AS</u>	<u>LN FE</u>	<u>LN TOC</u>	<u>GT SAND</u>	<u>SAND</u>
<u>CLAY</u>	<u>SILT</u>				
LN AS	+ .0000				
LN FE	+ .0000	+ .0000			
LN TOC	+ .0085	+ .0000	+ .0000		
GT SAND	+ .0115	+ .0686	- .0017	+ .0000	
SAND	- .0001	- .0001	+ .6162	- .0000	+ .0000
CLAY	+ .0001	+ .0000	+ .0000	+ .6977	- .0004
SILT	+ .0007	+ .0000	+ .0000	- .8636	- .0022
				+ .0000	+ .0000

STRENGTH OF SIGNIFICANT [alpha < 0.05] CORRELATIONS

RELATIVE MAGNITUDE: CLAY*TOC > CLAY*FE > CLAY*AS
CORRELATION COEFFICIENT: 0.55 > 0.44 > 0.32

RELATIVE MAGNITUDE: SILT*TOC > SILT*FE > SILT*AS
CORRELATION COEFFICIENT: 0.46 > 0.41 > 0.28

RELATIVE MAGNITUDE: SAND*AS > SAND*FE
CORRELATION COEFFICIENT: /-0.33/ > /-0.32/
WHERE: // INDICATES ABSOLUTE VALUE

RELATIVE MAGNITUDE: GT SAND*TOC > GT SAND*AS
CORRELATION COEFFICIENT: /-0.26/ > 0.21
WHERE: // INDICATES ABSOLUTE VALUE

RELATIVE MAGNITUDE: AS*FE > TOC*FE > AS*TOC
CORRELATION COEFFICIENT: 0.69 > 0.40 > 0.22

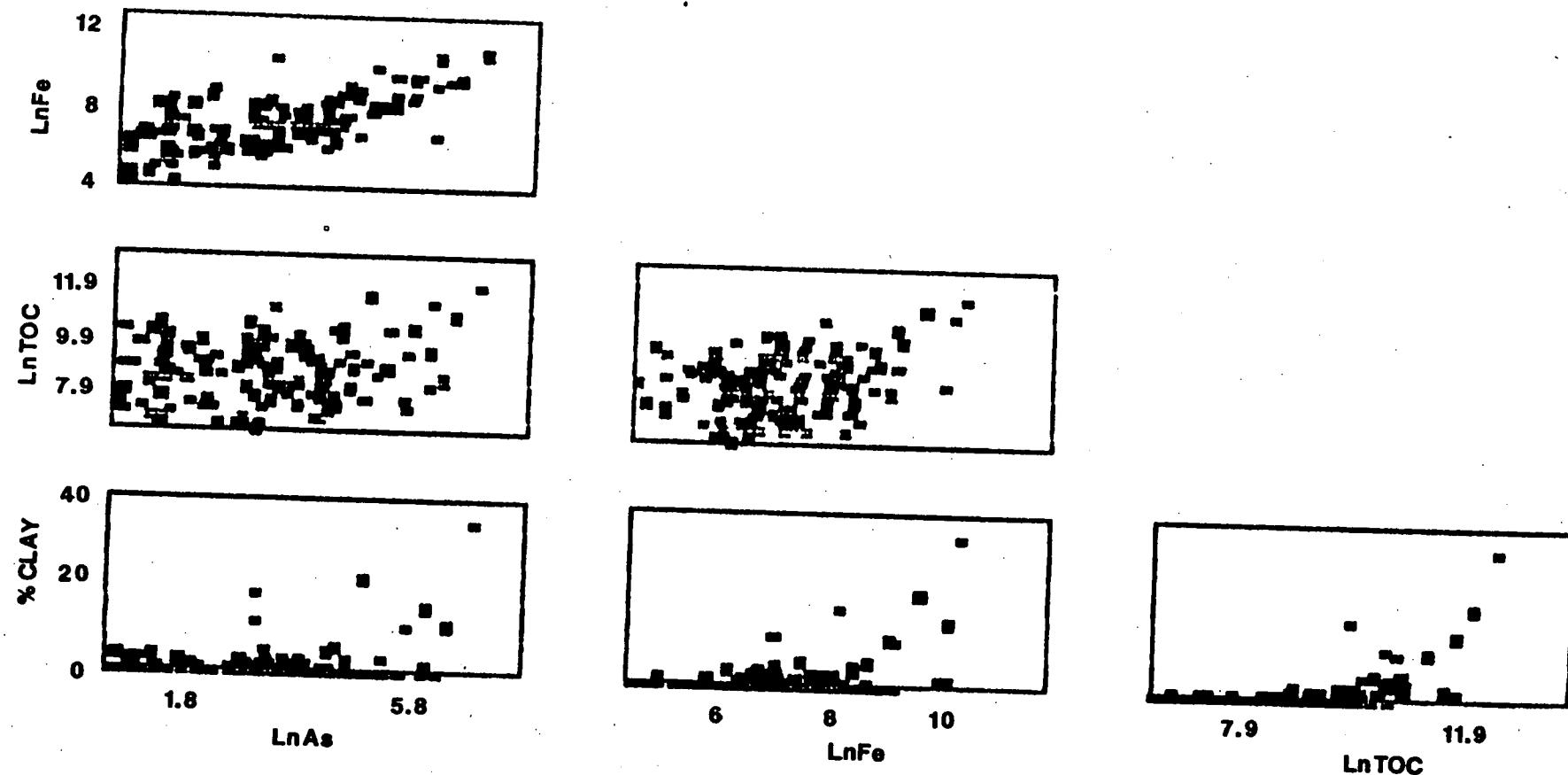
¹ MATRIX CELL ENTRIES:

TOP LINE = DIRECTION OF CORRELATION

BOTTOM LINE = ALPHA LEVEL OF SIGNIFICANCE OF CORRELATION
[-1.0 < ALPHA < 1.0]

FOR EXAMPLE, THE DIRECTION OF THE CORRELATION OF LN ARSENIC ON LN ARSENIC IS POSITIVE. THE ALPHA LEVEL OF SIGNIFICANCE IS 0.0000; IE, THERE IS A PERFECT 1:1 RELATIONSHIP

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U.S. ENVIRONMENTAL PROTECTION AGENCY
 VINELAND CHEMICAL COMPANY
 EXHIBIT J-5
 UPPER MAURICE RIVER: CLAY VS As/Fe/TOC
 EBASCO SERVICES INCORPORATED

Discussion

The relationships observed in the sediment samples in the upper Maurice River exhibited chemistry similar to that found in the sediment samples downstream of the Vichem Site. All chemical parameters were positively correlated to clay and silt, negatively to sand and negatively or ambivalently to the greater than sand fraction. However, the relative strength of the chemical relationships [As*Fe, As*TOC, Fe*TOC] differs in the two stretches. During Ebasco's RI investigation, a beaver dam which was located just downstream of station ER-4 on the Blackwater Branch was removed. The dam had created a swamp [upstream of the dam] which supported substantial biological activity, probably resulting in elevated concentrations of TOC. The comparatively weaker relationship of both As and Fe to TOC below the Blackwater Branch and upper Maurice River confluence could be the result of TOC dilution and/or degraded availability.

LOWER MAURICE RIVER

Results

1: Distribution Evaluation

Distributions of the data from the lower Maurice River were not so well behaved as those from the upper Maurice and the Blackwater Branch; none of a number of transformations effectively normalized the data. In fact, the transformations highlighted a tendency for bimodality in the distributions of chemicals and grainsize classes. This comparatively arbitrary behavior could be due to the decreased number of observations [n=17] and/or to the extreme heterogeneity of the salinity regime in the lower river.

2: Correlation Matrix

The heterogeneity of the chemical and grainsize class distributions suggested that the relationships could be masked in the correlation of all samples from the lower Maurice. For instance, if the chemistry of the fresh and saline waters differs in the direction of the relationship, equal sample sizes would confound positive with negative correlations, with a net result of insignificance in the correlation coefficient. Three correlation matrices were constructed. The first, Exhibit J-6, is the correlation of all sediment samples taken downstream of the Union Lake dam. Exhibits J-7 and J-8 present the correlation matrices of sediment data from fresh and saline waters, respectively.

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In the full dataset [n=16], only sand correlated [negatively] with Fe and TOC. No grainsize class correlated to concentrations of As. In the fresh water sediment samples, a significant correlation was observed between As and the greater than sand fraction. In the saline sediment samples [from the lower reaches of the lower Maurice River], significant correlations were observed between As and clay [negative] and greater than sand [positive].

3: Draftsman Plots

Exhibit J-9 displays the draftsman plots for the saline sediment samples: ln-transformed As, Fe and TOC vs clay and greater than sand.

Discussion

No simple explanation for these relationships as exhibited in the full data set and the two partitioned data sets, is apparent. Given the limited data set for the lower Maurice River [n=16], particularly when partitioned by salt-content [n=8 for fresh and n=8 for saline samples], the observed relationships could be spurious or the result of mechanical transport processes rather than chemical absorption.

EXHIBIT J-6

LOWER MAURICE RIVER: CORRELATION MATRIX ¹
[N=16]

	<u>LN AS</u>	<u>LN FE</u>	<u>LN TOC</u>	<u>GT SAND</u>	<u>SAND</u>
<u>CLAY</u>	<u>SILT</u>				
LN AS	+				
	.0000				
LN FE	+	+			
	.2905	.0000			
LN TOC	+	+	+		
	.3490	.4823	.0000		
GT SAND	+	+	+	+	
	.2364	.0681	.0641	.0000	
SAND	+	-	-	-	+
	.5704	.0062	.0151	.0027	.0000
CLAY	-	+	+	+	-
	.3023	.0691	.1502	.4627	.0038
SILT	-	+	-	-	-
	.7969	.4532	.6464	.2520	.0594
					+
					.0928
					.0000

STRENGTH OF SIGNIFICANT [alpha < 0.05] CORRELATIONS

RELATIVE MAGNITUDE: SAND*FE > SAND*TOC

CORRELATION COEFFICIENT: /-0.65/ > /-0.57/

WHERE: / / INDICATES ABSOLUTE VALUE

1 MATRIX CELL ENTRIES:

TOP LINE = DIRECTION OF CORRELATION

BOTTOM LINE = ALPHA LEVEL OF SIGNIFICANCE OF CORRELATION

[-1.0 < ALPHA < 1.0]

FOR EXAMPLE, THE DIRECTION OF THE CORRELATION OF LN ARSENIC ON LN ARSENIC IS POSITIVE. THE ALPHA LEVEL OF SIGNIFICANCE IS 0.0000; IE, THERE IS A PERFECT 1:1 RELATIONSHIP

EXHIBIT J-7
LOWER MAURICE RIVER [FRESH WATER]: CORRELATION MATRIX 1
 [N=9]

	<u>LN AS</u>	<u>LN FE</u>	<u>LN TOC</u>	<u>GT SAND</u>	<u>SAND</u>
<u>CLAY</u>	<u>SILT</u>				
LN AS	+				
	.0000				
LN FE	+	+			
	.2073	.0000			
LN TOC	+	+	+		
	.1661	.9621	.0000		
GT SAND	+	+	+	+	
	.0396	.2121	.1056	.0000	
SAND	-	-	-	-	+
	.9037	.1473	.3651	.1882	.0000
CLAY	+	+	+	+	-
	.8346	.1329	.6527	.2897	.0070
SILT	-	+	+	+	-
	.6163	.2154	.7301	.5678	.0004
					.0243
					.0000

STRENGTH OF SIGNIFICANT [alpha < 0.05] CORRELATIONS

THE SINGLE STATISTICALLY SIGNIFICANT RELATIONSHIP BETWEEN
 GRAINSIZE*CHEMICAL PARAMETER IS:
 LN AS*GREATER THAN SAND
 CORRELATION COEFFICIENT: 0.73

¹ MATRIX CELL ENTRIES:

TOP LINE = DIRECTION OF CORRELATION

BOTTOM LINE = ALPHA LEVEL OF SIGNIFICANCE OF CORRELATION
 [-1.0 < ALPHA < 1.0]

FOR EXAMPLE, THE DIRECTION OF THE CORRELATION OF LN ARSENIC ON LN
 ARSENIC IS POSITIVE. THE ALPHA LEVEL OF SIGNIFICANCE IS 0.0000;
 IE, THERE IS A PERFECT 1:1 RELATIONSHIP

EXHIBIT J-8
LOWER MAURICE RIVER [SALINE]: CORRELATION MATRIX 1
[N=8]

<u>CLAY</u>	<u>LN AS</u>	<u>LN FE</u>	<u>LN TOC</u>	<u>GT SAND</u>	<u>SAND</u>
<u>LN AS</u>	<u>SILT</u>				
	+				
	.0000				
<u>LN FE</u>	+	+			
	.0886	.0000			
<u>LN TOC</u>	+	-	+		
	.9479	.5863	.0000		
<u>GT SAND</u>	+	+	+	+	
	.0479	.5851	.5531	.0000	
<u>SAND</u>	-	+	+	-	+
	.1560	.9746	.9926	.0111	.0000
<u>CLAY</u>	-	-	-	-	+
	.0166	.1316	.4210	.0154	.2869
<u>SILT</u>	-	-	-	-	+
	.1980	.7981	.2520	.0020	.1351
					.0322
					.0000

STRENGTH OF SIGNIFICANT [alpha < 0.05] CORRELATIONS

RELATIVE MAGNITUDE: CLAY*AS > SAND*AS

CORRELATION COEFFICIENT: /-0.80/ > 0.71

WHERE: / / INDICATES ABSOLUTE VALUE

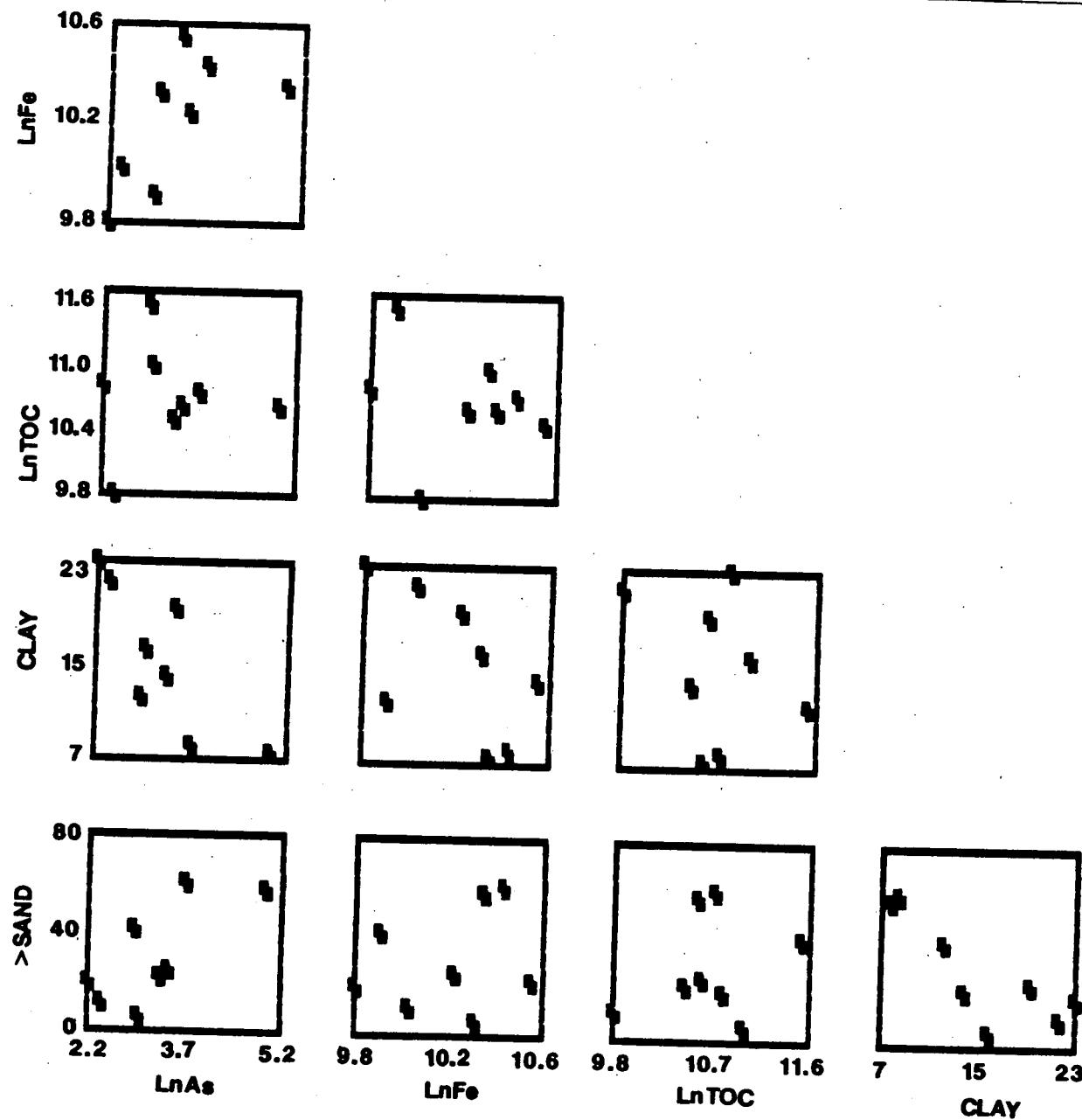
1 MATRIX CELL ENTRIES:

TOP LINE = DIRECTION OF CORRELATION

BOTTOM LINE = ALPHA LEVEL OF SIGNIFICANCE OF CORRELATION

[-1.0 < ALPHA < 1.0]

FOR EXAMPLE, THE DIRECTION OF THE CORRELATION OF LN ARSENIC ON LN ARSENIC IS POSITIVE. THE ALPHA LEVEL OF SIGNIFICANCE IS 0.0000; IE, THERE IS A PERFECT 1:1 RELATIONSHIP.



U.S. ENVIRONMENTAL PROTECTION
AGENCY
VINELAND CHEMICAL COMPANY
EXHIBIT J-9
LOWER MAURICE RIVER (SALINE):
CLAY & > SAND VS As/Fe/TOC
EBASCO SERVICES INCORPORATED

2011 - 800 MIA

APPENDIX K

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APPENDIX K
CITY OF MILLVILLE AND VINELAND
PUBLIC WATER SUPPLY ANALYSES

WTW008 1104

COMMISSIONERS

K: C C

THE HORNBOOK

OFFICERS

52.

**SUMNER N. LIPPINCOTT, MAYOR
DIRECTOR OF PUBLIC AFFAIRS**

CHESTER M. GOODWIN, III
DIRECTOR OF REVENUE AND FINANCE

ROBERT J. SHANNON
DIRECTOR OF PARKS AND PUBLIC PROPERTY

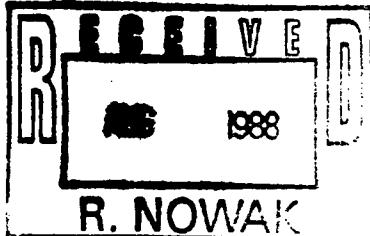
EMIL L. VAN HOOK
DIRECTOR OF PUBLIC SAFETY

DALE L. FINCH
DIRECTOR OF PUBLIC WORKS

CITY OF MILLVILLE NEW JERSEY

MAILING ADDRESS: P. O. Box 609
MILLVILLE, NEW JERSEY 08332

TELEPHONE: (609) 825-7000



August 24, 1988

Dear Paula:

Please send me any and all findings pertaining to your examination of the Millville Airport.

Thank you,

Jack C. Harris
Water Superintendent

JCH:dah

enc.

WIN 002 . 1103

SECONDARY SUBSTANCES ANALYSIS INPUT FORM

State CITY of MILLVILLE WATER
Address P.O. Box 609

City MILLVILLE

State N.J. Zip 08332

Location at which sample collected:

Address FAIRTON RD. / RT 49

City MILLVILLE

County CUMBERLAND

PWS ID# 0 6 1 0 0 0 1 SC

Plant Name =

Laboratory ID# 0 6 4 3 1

Laboratory Name SOUTH JERSEY TESTING

Collection Date 6/16/88

Sample Type D

Collected by MILLVILLE WATER DEPT

Analyzed by SOUTH JERSEY TESTING

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (< / -)	mg/l <small>(ppm) *</small>		
1905 - Color	<	10	110.2	6-16-88
1095 - Zinc	<	0.01	289.1	6-29-88
1920 - Odor	<	1	207	6-16-88
2905 - ABS/L.A.S.	<	0.01	425.1	6-17-88
1017 - Chloride		11	325.3	6-17-88
1022 - Copper		0.55	220.1	6-29-88
1916 - Hardness (as CaCO ₃)		23	130.2	6-18-88
1028 - Iron		0.22	236.1	6-29-88
1032 - Manganese		0.01	243.1	6-29-88
1055 - Sulfate		1.0	375.4	6-17-88
1930 - Total Dissolved Solids	>	36	160.1	6-17-88
1910 - Corrosivity (L.I.)	-	4.5	BY CALCULATION	-
1925 - pH		5.0	150.1	6-16-88
1929 - Alkalinity (as CaCO ₃)		16	310.1	6-18-88
Temperature		70° F	170.1	6-16-88

*Determinations in ppm (mg/l) except color (CU), odor(TON), corrosivity, pH, and temperature(° F)

Form prepared by: Owner/Operator or Laboratory

STEVE ROBERTS

Print Name

609 () 455 - 4204

Phone Number

Steve Roberts

Signature of Representative

7/19/88

Date

NOTE: See reverse side for sample type key.

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1106

SECONDARY SITE SPANDED ANALYSIS INPUT FORM

Name CITY of MILLVILLE WATER
 Address P.O. Box 609
 City MILLVILLE
 State N.J. Zip 08332

PWS ID# 0 6 1 0 0 0 1 SC

Plant Name _____

Laboratory ID# 0 6 4 3 1

Laboratory Name SOUTH JERSEY TESTING

Collection Date 6/16/88

Sample Type D

Collected by CITY of MILLVILLE WATER

Analyzed by SO. JERSEY TESTING

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (</=)	mg/l * (PPM)		
1905 - Color	<	10	110.2	6-16-88
1095 - Zinc	<	0.01	289.1	6-29-88
1920 - Odor	<	1	207	6-16-88
2905 - ABS/L.A.S.	<	0.01	425.1	6-17-88
1017 - Chloride		8.9	325.3	6-17-88
1022 - Copper		0.03	220.1	6-29-88
1916 - Hardness (as CaCO ₃)		29	130.2	6-18-88
1028 - Iron		0.42	236.1	6-29-88
1032 - Manganese		0.03	243.1	6-29-88
1055 - Sulfate		13	375.4	6-17-88
1930 - Total Dissolved Solids		60	160.1	6-17-88
1910 - Corrosivity (LI)	-	1.5	BY CALCULATED	-
1925 - pH		7.1	150.1	6-16-88
1929 - Alkalinity (as CaCO ₃)		42	310.1	6-18-88
Temperature		68	170.1	6-16-88

*Determinations in ppm (mg/l) except color (CU), odor(TON), corrosivity, pH, and temperature(° F)

Form prepared by: Owner/Operator or X Laboratory

STEVE ROBERTS

Print Name

Steve Roberts

Signature of Representative

7/19/88

Date

609, 455-4204

Phone Number

NOTE: See reverse side for sample type key.

SECONDARY SUBSTANCES ANALYSIS INPUT FORM

Name CITY of MILLVILLE WATER
Address P.O. Box 609

City MILLVILLE

State N.J. Zip 08332

Location at which sample collected:

Address CEDARVIEW COURT (WATERSON AVE)

City MILLVILLE

County CUMBERLAND

PWS ID# 0 6 1 0 0 0 1 SC

Plant Name =

Laboratory ID# 0 6 4 3 1

Laboratory Name SOUTH JERSEY TEST

Collection Date 6 / 16 / 88

Sample Type D

Collected by MILLVILLE WATER DEPT.

Analyzed by SO. JERSEY TEST

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (< / -)	mg/l * (PPM)		
1905 - Color	<	10	110.2	6-16-88
1095 - Zinc	<	0.01	289.1	6-29-88
1920 - Odor	<	1	207	6-16-88
2905 - ABS/L.A.S.	<	0.01	425.1	6-17-88
1017 - Chloride		7.8	325.3	6-17-88
1022 - Copper		0.06	220.1	6-29-88
1916 - Hardness (as CaCO ₃)		34	130.2	6-18-88
1028 - Iron		0.13	236.1	6-29-88
1032 - Manganese		0.01	243.1	6-29-88
1055 - Sulfate		12	375.4	6-17-88
1930 - Total Dissolved Solids		55	160.1	6-17-88
1910 - Corrosivity (LI)	-	2.1	BY CALCULATION	—
1925 - pH		6.7	150.1	6-16-88
1929 - Alkalinity (as CaCO ₃)		21	310.1	6-18-88
Temperature		68	170.1	6-16-88

*Determinations in ppm (mg/l) except color (CU), odor(TON), corrosivity, pH, and temperature(° F)

Form prepared by: Owner/Operator or X Laboratory

STEVE ROBERTS

Print Name

609, 455-4204

Phone Number

Steve Roberts
Signature of Representative

7/19/88
Date

NOTE: See reverse side for sample type key.

8/11/88

INORGANIC CHEMICAL ANALYSIS INPUT FORM

Name CITY OF MILLVILLE WATER DEPT.

PWS ID# 0610001 IN

Address P.O. BOX 609

Plant Name _____

City MILLVILLE

Laboratory ID# 06431

State NJ Zip 08302

Laboratory Name SOUTH JERSEY TESTING

Location at which sample collected:

Collection Date 6/16/88

Address NEIGHBORHOOD CENTER (SO. 2ND ST.)

Sample Type: D

City MILLVILLE

Collected by MILLVILLE WATER DEPT.

County CUMBERLAND

Analyzed by SOUTH JERSEY TESTING

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (+)	mg/l (PPM)		
1005 - Arsenic	-	0.005	206.2	6-30-88
1010 - Barium	-	0.1	208.1	6-29-88
1015 - Cadmium	-	0.001	213.2	6-30-88
1020 - Chromium	-	0.01	218.2	6-30-88
1025 - Fluoride		0.10	340.2	6-16-88
1030 - Lead	-	0.005	239.2	6-30-88
1035 - Mercury	-	0.0005	245.1	7-1-88
1040 - Nitrate (as N)		1.8	353.3	6-16-88
1045 - Selenium	-	0.005	270.2	6-30-88
1050 - Silver	-	0.001	272.2	6-30-88
1052 - Sodium		5.4	273.1	6-29-88

Form prepared by: Owner/Operator or Laboratory

STEVE ROBERTS

Steve Roberts

Print Name

Signature of Representative

(609) 455-4204

Phone #

7/19/88
Date

Note: See reverse side for analysis methods and sample type key.

100-100-00000
10/11/94

Water Quality Control Program
Ground Water Pollution Control Laboratory
State Environmental Service

INORGANIC CHEMICAL ANALYSIS INPUT FORM

Name CITY OF MILLVILLE WATER DEPT.

Address P.O. BOX 609

City MILLVILLE

State NJ ZIP 08302

Location at which sample collected:

Address CEDARVIEW CT. (WHEATON AVE)

City MILLVILLE

County CUMBERLAND

PWS ID# 0612001 IN

Plant Name _____ # _____

Laboratory ID# 06431

Laboratory Name SOUTH JERSEY TESTING

Collection Date 6/16/88

Sample Type D

Collected by MILLVILLE WATER DEPT.

Analyzed by SOUTH JERSEY TESTING

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	mg/l (PPM)		
1005 - Arsenic	<	0.005	206.2	6-30-88
1010 - Barium	<	0.1	208.1	6-29-88
1015 - Cadmium	<	0.001	213.2	6-30-88
1020 - Chromium	<	0.01	218.2	6-30-88
1025 - Fluoride		0.09	340.2	6-16-88
1030 - Lead	<	0.005	239.2	6-30-88
1035 - Mercury	<	0.0005	245.1	7-1-88
1040 - Nitrate (as N)		1.0	353.3	6-16-88
1045 - Selenium	<	0.005	270.2	6-30-88
1050 - Silver	<	0.01	272.2	6-30-88
1052 - Sodium		5.1	273.1	6-29-88

Form prepared by: Owner/Operator or Laboratory

STEVE Roberts

Print Name

(609) 455-4204

Phone #

Suz Board
Signature of Representative

7/9/88
Date

Note: See reverse side for analysis methods and sample type key.

VINYL 110

INORGANIC CHEMICAL ANALYSIS INPUT FORM

Name CITY OF MILLVILLE WATER DEPT.
Address P.O. BOX 609
City MILLVILLE
State NJ Zip 08302

Location at which sample collected:

Address FAIRFON RD & RT. 49
City MILLVILLE
County CUMBERLAND

PWS ID# 0610001 IN

Plant Name _____

Laboratory ID# 06431

Laboratory Name SOUTH JERSEY TESTING

Collection Date 6/16/88

Sample Type: D

Collected by MILLVILLE WATER DEPT.

Analyzed by SOUTH JERSEY TESTING

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	mg/l (PPM)		
1005 - Arsenic	<	0.005	206.2	6-30-88
1010 - Barium	<	0.1	208.1	6-29-88
1015 - Cadmium	<	0.001	213.2	6-30-88
1020 - Chromium	<	0.01	218.2	6-30-88
1025 - Fluoride	<	0.05	340.2	6-16-88
1030 - Lead	<	0.005	239.2	6-30-88
1035 - Mercury	<	0.0005	245.1	7-1-88
1040 - Nitrate (as N)		4.2	353.3	6-16-88
1045 - Selenium	<	0.005	270.2	6-30-88
1050 - Silver	<	0.001	272.2	6-30-88
1052 - Sodium		3.6	273.1	6-29-88

Form prepared by: Owner/Operator or Laboratory

STEVE ROBERTS

Print Name

(609) 455-4204

Phone #

Steve Roberts
Signature of Representative

7/9/88
Date

Note: See reverse side for analysis methods and sample type key.

RD #1 Irving Ave., Millville, NJ 08332
MAILING: P.O. Box 360, Bridgeton New Jersey 08302

(609) 455-4264

07/11/88

SAMPLE LOCATION: Neighborhood Center
South 2nd. Street
Millville
BLOCK:

Cumberland County
LOT:

Millville Water Dept.
CLIENT: F.O. Box 609
Millville

NJ 08332

SAMPLE NUMBER 16458-3

TYPE City Water

SAMPLED 6-16-88

NJ DEP. CERTIFICATION NO. 06431

RECEIVED 6-16-88

COLLECTED BY Client

RESULTS IN mg/l (ppm)
UNLESS OTHERWISE NOTED

< = LESS THAN
' = NOT DETECTED

	RESULT	LIMIT	RESULT	LIMIT
NITRATE, N	1.8	10	LEAD, Pb	<0.005 0.05
IRON, Fe	0.30		CHLORINE, Cl	
MANGANESE, Mn	0.05		SODIUM	5.4
pH, S.U.			FLUORIDE	0.10
COLIFORM BACTERIA 100 ml.	0		ARSENIC	<0.005
MBAS (DETERGENTS)	0.50		SELENIUM	<0.005
SULFATE, SO ₄	250		CHROMIUM	<0.01
CHLORIDE, Cl	250		MERCURY	<0.0005
TOTAL DISSOLVED SOLIDS	500		SILVER	<0.001
FECAL COLIFORMS/100 ml.			BARIUM	<0.1
HARDNESS, CaCO ₃			CADMIUM	<0.001
COPPER, Cu	1.0			

COMMENTS:

INORGANICS

Water Treatment Systems N/A in use.

PAID?

SEE INVOICE: Mo.

LAB DIRECTOR

VINOD 1112

RD #1 Irving Ave., Millville, NJ 08332
MAILING: P.O. Box 360, Bridgeton New Jersey 08302

(609) 455-4202

07/11/88

SAMPLE LOCATION: Cedarville Ct.
Wheaton Ave.
Millville
BLOCK:

Cumberland County
LOT:

Millville Water Dept.
CLIENT: P.O. Box 609
Millville NJ 08332

SAMPLE NUMBER 16458-2

TYPE City Water

SAMPLED 6-16-88

RECEIVED 6-16-88

RESULTS IN mg/L UNLESS OTHERWISE NOTED <= LESS THAN (NOT DETECTED)

COLLECTED BY Client

	RESULT	LIMIT	RESULT	LIMIT
NITRATE, N	1.0	10	LEAD, Pb	<0.005 0.05
IRON, Fe	0.30		CHLORINE, Cl	
MANGANESE, Mn	0.05		SODIUM	5.1
pH, S.U.			FLUORIDE	0.09
COLIFORM BACTERIA/100 ml.	0		ARSENIC	<0.005
MBAS (DETERGENTS)	0.50		SELENIUM	<0.005
SULFATE, SO ₄	250		CHROMIUM	<0.01
CHLORIDE, Cl	250		MERCURY	<0.0005
TOTAL DISSOLVED SOLIDS	500		SILVER	<0.001
FECAL COLIFORMS/100 ml.			BARIUM	<0.1
HARDNESS, CaCO ₃			CADMIUM	<0.001
COPPER, Cu	1.0			

COMMENTS:

INORGANICS

Water Treatment Systems N/A in use.

PAID?

SEE INVOICE: Mo.

LAB DIRECTOR

VINOD 115

RD #1 Irving Ave., Millville, NJ 08332
MAILING: P.O. Box 360, Bridgeton New Jersey 08302

(609) 455-4204

SAMPLE LOCATION: W. Side Laundromat
Fairton Rd. & RT. 49
Millville
BLOCK:

07/11/88

Cumberland County
LOT:

CLIENT: Millville Water Dept.
P.O. Box 609
Millville NJ 08332

SAMPLE NUMBER 16458-1

TYPE City Water

SAMPLED 6-16-88

RECEIVED 6-16-88

NJ DEP. CERTIFICATION NO. 06431

COLLECTED BY Client

RESULTS IN mg/l (ppm)
UNLESS OTHERWISE NOTED

< = LESS THAN
(NOT DETECTED)

	RESULT	LIMIT	RESULT	LIMIT
NITRATE, N	4.2	10	LEAD, Pb	<0.005 0.05
IRON, Fe		0.30	CHLORINE, Cl	
MANGANESE, Mn		0.05	SODIUM	3.6
pH S.U.			FLUORIDE	<0.05
COLIFORM BACTERIA 100 ml.	0		ARSENIC	<0.005
MBAS (DETERGENTS)	0.50		SELENIUM	<0.005
SULFATE, SO ₄	250		CHROMIUM	<0.01
CHLORIDE, Cl	250		MERCURY	<0.0005
TOTAL DISSOLVED SOLIDS	500		SILVER	<0.001
FECAL COLIFORMS/100 ml.			BARIUM	<0.1
HARDNESS, CaCO ₃			CADMIUM	<0.001
COPPER, Cu	1.0			

COMMENTS:

INORGANICS

Water Treatment Systems N/A in use.

PAID?

SEE INVOICE: Mo.

LAB DIRECTOR

7/11/88
INVOICED

New Jersey Department of Environmental Protection
 Division of Water Resources — Bureau of Safe Drinking Water
 CN 029, Trenton, N.J. 08625

COPY

INORGANIC CHEMICAL ANALYSIS INPUT FORM



Name City of Vineland
 Address 330 East Walnut Rd.
 City Vineland
 State N.J. Zip 08360

Location at which sample collected:

Address Martine's Florist
 City Vineland
 County Cumberland

PWS ID# 0 6 1 4 0 863 **IN**

Plant Name _____ # _____

Laboratory ID# 0 4 4 7 9

Laboratory Name P & P Labs, Inc.

Collection Date 5/11/88

Sample Type: D

Collected by ART Lonabaugh

Analyzed by P & P Labs Inc.

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	mg/l (PPM)		
1005 - Arsenic	<	0.05	SM 304	6/12/88
1010 - Barium	<	0.10	SM 303C	6/15/88
1015 - Cadmium	<	0.01	SM 303A	6/09/88
1020 - Chromium	<	0.05	SM 303A	6/09/88
1025 - Fluoride		1.02	SM 413C	6/09/88
1030 - Lead	<	0.05	SM 304	6/09/88
1035 - Mercury	<	0.002	SM 303F	6/19/88
1040 - Nitrate (as N)		3.50	SM 418C	6/11/88
1045 - Selenium	<	0.01	SM 304	6/15/88
1050 - Silver	<	0.05	SM 303A	6/19/88
1052 - Sodium		6.20	SM 303A	6/09/88

Form prepared by: Owner/Operator or Laboratory

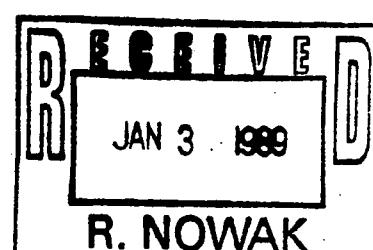
Henry Pielichowski
 Print Name

Henry Pielichowski
 Signature of Representative

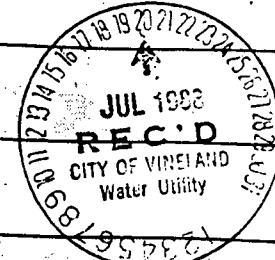
7/11/88
 Date

(609) 962-6611
 Phone #

Note: See reverse side for analysis methods and sample type key.



P & P LABORATORIES, INC.
ENVIRONMENTAL & CLINICAL TOXICOLOGY
211 White Horse Pike
Audubon, NJ 08106
(609) 547-8421
DEP # 04479



IDENTIFICATION

SAMPLE SOURCE

NAME : City of Vineland
address : 330 East Walnut Rd.
Vineland, NJ 08360
ID # : A 1338

SOURCE : Mennies School
Grant Ave.
collection : 5/11/88 15:08
received : 5/11/88 18:00
completion : 5/30/88

PRIMARY DRINKING WATER TESTS

ORGANICS

19 PARAMETERS	RESULTS *	MCL **	COMMENTS
20 Endrin	<0.0002	0.0002	
21 Lindane	<0.004	0.004	
22 Methoxychlor	<0.1	0.1	
23 Toxaphene	<0.005	0.005	
24 2,4-D	<0.1	0.1	
25 2,4,5-TP (Silvex)	<0.01	0.01	
26			
27			

OTHER TESTS

± 0.01 unless specified

* Maximum Contamination Level (mg/l)

Henry J. Fielichowski
Tech. Lab. Supervisor

Henry Peeler

CONTINU

P & P LABORATORIES, INC.

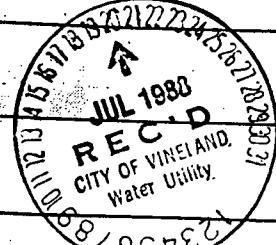
ENVIRONMENTAL & CLINICAL TOXICOLOGY

211 White Horse Pike

Audubon, NJ 08106

(609) 547-8421

DEP # 04479



IDENTIFICATION

name :

City of Vineland

SAMPLE SOURCE

source : Martine's Florist

address :

330 East Walnut Rd.

Counter Sink

Vineland, NJ 08360

collection : 5/11/88 13:52

ID #

A 1885-A

received : 5/11/88 18:00

completion : 5/30/88

PRIMARY DRINKING WATER TESTS

ORGANICS

PARAMETERS	RESULTS *	MCL **	COMMENTS
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Endrin	<0.0002	0.0002	
Lindane	<0.004	0.004	
Methoxychlor	<0.1	0.1	
Toxaphene	<0.005	0.005	
2,4-D	<0.1	0.1	
2,4,5-TP (Silvex)	<0.01	0.01	

OTHER TESTS

* mg/l unless specified

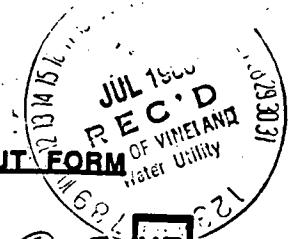
** Maximum Contamination Level (mg/l)

Henry J. Pielichowski

Tech. Lab. Supervisor

P & P LABORATORIES, INC.
ENVIRONMENTAL & CLINICAL TOXICOLOGY

211 White Horse Pike
Audubon, NJ 08106

PERIODIC HAZARDOUS CONTAMINANT (A-280) ANALYSIS INPUT FORM

Name City of Vineland
 Address 330 East Walnut Rd
 City Vineland
 State N.J. Zip 08360

Location at which sample collected:

Address Eckard Drugs
 City Vineland
 County Cumberland

PWS ID# 0614003 **HZ**

Plant Name _____ # _____

Laboratory ID# 04479Laboratory Name PSP Lab's Inc.Collection Date 4/12/88Sample Type: DCollected by ART LonabaughAnalyzed by PSP Labs Inc

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	ug/l (PPB)		
2984 — Trichloroethylene	<	0.100	S02.2	4/18/88
2987 — Tetrachloroethylene	<	0.010	S02.2	
2982 — Carbon Tetrachloride	<	0.100	S02.2	
2981 — 1,1,1 - Trichloroethane	<	0.010	S02.2	
2980 — 1,2 - Dichloroethane	<	0.010	S02.2	
2976 — Vinyl Chloride	<	0.100	S02.2	
2964 — Methylene Chloride	<	0.010	S02.2	
2990 — Benzene	<	0.100	S02.2	
2989 — Chlorobenzene	<	0.100	S02.2	
2401 — Total Dichlorobenzenes*	<	0.200	S02.2	
2378 — 1,2,4 - Trichlorobenzene	<	0.040	S02.2	
2977 — 1,1 - Dichloroethylene	<	0.100	S02.2	
2380 — cis - 1,2 - Dichloroethylene	<	0.100	S02.2	
2979 — trans - 1,2 - Dichloroethylene	<	0.100	S02.2	
2955 — Total Xylenes*	<	0.100	S02.2	
2383 — Total Polychlorinated Biphenyls*	<	0.080	608	
2959 — Chlordane	<	0.080	608	

* See note on the back of this form if detectable levels are found.

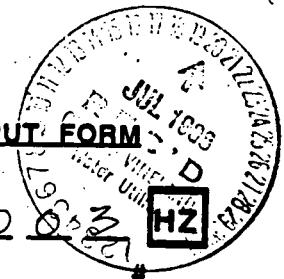
Form prepared by: Owner/Operator or Laboratory

I certify that this water sample was collected and analyzed in accordance with approved procedures established by the New Jersey Department of Environmental Protection from the location described above.

Print Name Henry PielichowskiSignature Henry Pielichowski4/18/88
Date

NOTE: See reverse side for analysis method numbers and sample type key.

VIN 007 1119

PERIODIC HAZARDOUS CONTAMINANT (A-280) ANALYSIS INPUT FORM

Name City of Vineland
 Address 330 East Walnut Rd
 City Vineland
 State N.J. Zip 08360

Location at which sample collected:

Address Dunkin Donuts
 City Park & Rt 47
 County Cumberland

PWS ID# 0614003 HZ

Plant Name _____

Laboratory ID# 04479Laboratory Name P & P Lab's Inc.Collection Date 4/12/88Sample Type: DCollected by ART LohabaughAnalyzed by P & P Labs Inc.

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	ug/l (PPB)		
2984 — Trichloroethylene	<	2.1	S02.2	4/18/88
2987 — Tetrachloroethylene	<	0.2	S02.2	
2982 — Carbon Tetrachloride	<	0.100	S02.2	
2981 — 1,1,1 - Trichloroethane	<	0.010	S02.2	
2980 — 1,2 - Dichloroethane	<	0.010	S02.2	
2976 — Vinyl Chloride	<	0.100	S02.2	
2964 — Methylene Chloride	<	0.010	S02.2	
2990 — Benzene	<	0.100	S02.2	
2989 — Chlorobenzene	<	0.100	S02.2	
2401 — Total Dichlorobenzenes*	<	0.200	S02.2	
2378 — 1,2,4 - Trichlorobenzene	<	0.040	S02.2	
2977 — 1,1 - Dichloroethylene	<	0.100	S02.2	
2380 — cis - 1,2 - Dichloroethylene	<	0.100	S02.2	
2979 — trans - 1,2 - Dichloroethylene	<	0.100	S02.2	
2955 — Total Xylenes*	<	0.100	S02.2	
2383 — Total Polychlorinated Biphenyls*	<	0.080	608	
2959 — Chlordane	<	0.080	608	

* See note on the back of this form if detectable levels are found.

Form prepared by: Owner/Operator or Laboratory

I certify that this water sample was collected and analyzed in accordance with approved procedures established by the New Jersey Department of Environmental Protection from the location described above.

Print Name Henry PiechowskiSignature Henry PiechowskiDate 4/18/88

NOTE: See reverse side for analysis method numbers and sample type key.

VTPN/MT/1120

PERIODIC HAZARDOUS CONTAMINANT (A-280) ANALYSIS INPUT FORM

Name City of Vineland
 Address 330 East Walnut Rd
 City Vineland
 State N.J. Zip 08360

Location at which sample collected:

Address Wawa Brewstore
 City Vineland
 County Cumberland

PWS ID# Q 6 1 4 0 0 3 **HZ**
 Plant Name _____
 Laboratory ID# 0 4 4 7 9
 Laboratory Name P+P Lab's Inc.
 Collection Date 4/12/88
 Sample Type: D
 Collected by ART Longabaugh
 Analyzed by D \$ P Labs Inc

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	ug/l (PPB)		
2984 — Trichloroethylene	<	0.100	S02.2	4/18/88
2987 — Tetrachloroethylene	<	0.010	S02.2	
2982 — Carbon Tetrachloride	<	0.100	S02.2	
2981 — 1,1,1 - Trichloroethane	<	0.010	S02.2	
2980 — 1,2 - Dichloroethane	<	0.010	S02.2	
2976 — Vinyl Chloride	<	0.100	S02.2	
2964 — Methylene Chloride	<	0.010	S02.2	
2990 — Benzene	<	0.100	S02.2	
2989 — Chlorobenzene	<	0.100	S02.2	
2401 — Total Dichlorobenzenes*	<	0.200	S02.2	
2378 — 1,2,4 - Trichlorobenzene	<	0.040	S02.2	
2977 — 1,1 - Dichloroethylene	<	0.100	S02.2	
2380 — cis - 1,2 - Dichloroethylene	<	0.100	S02.2	
2979 — trans - 1,2 - Dichloroethylene	<	0.100	S02.2	
2955 — Total Xylenes*	<	0.100	S02.2	
2383 — Total Polychlorinated Biphenyls*	<	0.080	608	
2959 — Chlordane	<	0.080	608	

* See note on the back of this form if detectable levels are found.

Form prepared by: Owner/Operator or Laboratory

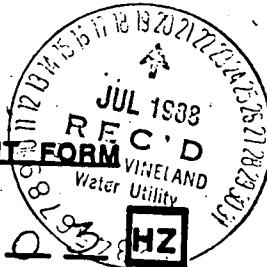
I certify that this water sample was collected and analyzed in accordance with approved procedures established by the New Jersey Department of Environmental Protection from the location described above.

Print Name Henry Frel, ChowskaSignature Henry FrelDate 4/18/88

NOTE: See reverse side for analysis method numbers and sample type key.

UTM01112

PERIODIC HAZARDOUS CONTAMINANT (A-280) ANALYSIS INPUT FORM



Name City of Vineland
 Address 338 East Walnut Rd
 City Vineland
 State N.J. Zip 08360

Location at which sample collected:

Address Winslow School
 City Vineland
 County Cumberland

PWS ID# 0 6 1 4 0 0 3 HZ

Plant Name _____ # _____

Laboratory ID# 0 4 4 7 9

Laboratory Name P & P Labs Inc.

Collection Date 4/12/88

Sample Type: D

Collected by Avt Lonabaugh

Analyzed by P & P Labs Inc.

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	ug/l (PPB)		
2984 — Trichloroethylene	<	0.100	S02.2	4/18/88
2987 — Tetrachloroethylene	<	0.010	S02.2	
2982 — Carbon Tetrachloride	<	0.100	S02.2	
2981 — 1,1,1 - Trichloroethane	<	0.010	S02.2	
2980 — 1,2 - Dichloroethane	<	0.010	S02.2	
2976 — Vinyl Chloride	<	0.100	S02.2	
2964 — Methylene Chloride	<	0.010	S02.2	
2990 — Benzene	<	0.100	S02.2	
2989 — Chlorobenzene	<	0.100	S02.2	
2401 — Total Dichlorobenzenes*	<	0.200	S02.2	
2378 — 1,2,4 - Trichlorobenzene	<	0.040	S02.2	
2977 — 1,1 - Dichloroethylene	<	0.100	S02.2	
2380 — cis - 1,2 - Dichloroethylene	<	0.100	S02.2	
2979 — trans - 1,2 - Dichloroethylene	<	0.100	S02.2	
2955 — Total Xylenes*	<	0.100	S02.2	
2383 — Total Polychlorinated Biphenyls*	<	0.080	608	
2959 — Chlordane	<	0.080	608	

* See note on the back of this form if detectable levels are found.

Form prepared by: Owner/Operator or X Laboratory

I certify that this water sample was collected and analyzed in accordance with approved procedures established by the New Jersey Department of Environmental Protection from the location described above.

Print Name Henry J. Zielchowski

Signature Henry J. Zielchowski

4/18/88
Date

NOTE: See reverse side for analysis method number and sample type key.

PERIODIC HAZARDOUS CONTAMINANT (A-280) ANALYSIS INPUT FORM 'D'

Name City of Vineland
 Address 330 East Walnut Rd
 City Vineland
 State N.J. Zip 08360

Location at which sample collected:

Address Dippolito school
 City Vineland
 County A. J. Cumberland

PWS ID# 0 6 1 4 0 Q 3 HZ
 Plant Name _____
 Laboratory ID# 0 4 4 7 9
 Laboratory Name P & P Labs Inc.
 Collection Date 4/12/88
 Sample Type: D
 Collected by ART Lonabaugh
 Analyzed by P & P Labs Inc

Contaminant ID and Name	Analysis Results		Analysis Method #	Analysis Date
	Sign (<)	ug/l (PPB)		
2984 — Trichloroethylene	<	0.100	S02.2	4/18/88
2987 — Tetrachloroethylene	<	0.010	S02.2	
2982 — Carbon Tetrachloride	<	0.100	S02.2	
2981 — 1,1,1 - Trichloroethane	<	0.010	S02.2	.
2980 — 1,2 - Dichloroethane	<	0.010	S02.2	
2976 — Vinyl Chloride	<	0.100	S02.2	
2964 — Methylene Chloride	<	0.010	S02.2	
2990 — Benzene	<	0.100	S02.2	
2989 — Chlorobenzene	<	0.100	S02.2	
2401 — Total Dichlorobenzenes*	<	0.200	S02.2	
2378 — 1,2,4 - Trichlorobenzene	<	0.040	S02.2	
2977 — 1,1 - Dichloroethylene	<	0.100	S02.2	
2380 — cis - 1,2 - Dichloroethylene	<	0.100	S02.2	
2979 — trans - 1,2 - Dichloroethylene	<	0.100	S02.2	
2955 — Total Xylenes*	<	0.100	S02.2	
2383 — Total Polychlorinated Biphenyls*	<	0.080	608	
2959 — Chlordane	<	0.080	608	✓

* See note on the back of this form if detectable levels are found.

Form prepared by: Owner/Operator or Laboratory

I certify that this water sample was collected and analyzed in accordance with approved procedures established by the New Jersey Department of Environmental Protection from the location described above.

Print Name Henry PrelichowskiSignature Henry PrelichowskiDate 4/18/88

NOTE: See reverse side for analysis method numbers and sample type key.

APPENDIX L

WIN 002-1124

APPENDIX L

ENVIRONMENTAL RESPONSE BRANCH
BIOLOGICAL ASSESSMENT OF THE BLACKWATER
BRANCH AND THE UPPER MAURICE RIVER

INT 002 1125

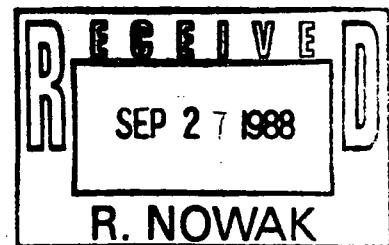


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EDISON, NEW JERSEY 08837

August 22, 1988

MEMORANDUM



SUBJECT: Biological Assessment of Vineland Chemical Site

FROM: David W. Charters, Ph.D.
Environmental Scientist
Environmental Response Team

TO: Fred Cataneo
Regional Project Manager
Region II

Enclosed please find a copy of the biological assessment of the Vineland Chemical Site, Vineland, New Jersey.

The findings of the report show a significant impact of the site on the Blackwater Branch of the Maurice River. In addition to the environmental impact the arsenic levels in the water exceed both the NJDEP and EPA drinking water standards.

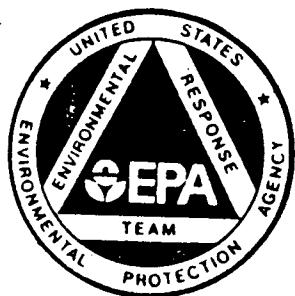
Please feel free to contact me if you have any questions on the report or if I can be of any other help.

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FINAL REPORT
ON THE VINELAND CHEMICAL SITE

VINELAND, NEW JERSEY



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INTRODUCTION

Site Background

The Vineland Chemical site, located in Cumberland County, New Jersey, is a 54-acre manufacturing facility involved in the production of arsenical herbicides, fungicides, and biocides. It is an active facility that has been in production since 1949. Arsenical feedstock compounds were historically stored in unprotected piles although this practice has been discontinued. This has resulted in soil and groundwater contamination in the vicinity of the site. In addition, runoff during storm events and recharge of arsenic bearing groundwater has contaminated the adjacent watershed, including the Blackwater Branch, the Maurice River, and Union Lake. Arsenic contaminated groundwater, process water, non-contact cooling water, and stormwater runoff are currently treated on site. Effluent containing approximately 0.7 milligrams per liter (mg/l) arsenic is discharged from the on-site wastewater treatment facility to an unlined lagoon where it percolates into the ground.

Previous studies have investigated the extent and magnitude of arsenic contamination in the Maurice River watershed (Faust et al., 1980). Data available concerning arsenic contamination indicates that both the water and sediment are contaminated. Total arsenic concentrations in the water column ranged from 154 to 2,780 micrograms per liter (ug/l). The maximum concentration observed in the sediments was 2.29 milligrams per kilogram (mg/kg), while the interstitial water contained 12.5 mg/l total arsenic. The NJ Department of Environmental Protection (NJ DEP) and the US Environmental Protection Agency (US EPA) standards for drinking water are 0.05 mg/l. Concentrations of arsenic in the water have historically been in excess of this standard in the Blackwater Branch, the Maurice River, and Union Lake. The contamination ranges from the vicinity of the Vineland Chemical facility to a point approximately 26.5 miles downstream from the site.

Objectives

The objective of this study was to determine if the arsenic compounds present in the water and sediments of the Maurice River watershed are resulting in an adverse ecological impact. The data collected was utilized in conjunction with existing data to determine the bioavailability and toxicity of arsenic contamination to the resident aquatic biological communities and quantitatively assess impacts.

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INTROD

MATERIALS AND METHODS

The environmental assessment was accomplished through examination of several in-situ environmental variables in conjunction with laboratory analysis. Water, sediment, and resident biota were collected and submitted for various physical/chemical determinations. Additional sediments were secured and utilized for toxicity testing with three species. The benthic invertebrate community was sampled and the structure and function of this segment of the aquatic ecosystem was evaluated in light of the contaminants detected and observations made.

The study area consists of waterbodies adjacent to and downstream from the Vineland site (Figure 1). These include the Blackwater Branch, the Maurice River, and Union Lake, an impoundment of the Maurice River. Samples and in-situ water quality data were collected from eight locations (Figure 2). The sampling activities occurring at each location are detailed in Table 1.

Water was collected and analyzed for total and dissolved arsenic, and total hardness determinations. In the Blackwater Branch, water was collected from a point mid-channel, at a depth of approximately one third the total stream depth. The Maurice River was greater than one meter in depth at the sampling locations; water was collected within the main flow of this waterbody from a point as far from the river bank as practical. Water samples were collected from mid-depth in the littoral region of the three Union Lake sampling locations. At all locations, the sample container was employed as the sample collection implement by immersing it into the water column and allowing it to fill to volume. Care was taken to exclude disturbed sediment from the sample.

Arsenic in the dissolved form was determined in conjunction with total arsenic concentration. The dissolved fraction is a functional term, defined as those constituents of an unacidified sample that pass through an 0.45 micron (μm) filter. Total metal is the concentration detected in an unfiltered sample after vigorous digestion. The particulate fraction was determined mathematically and is the difference between the total and dissolved fractions. Two liters of water were collected at each location. One liter was preserved immediately with nitric acid and reserved for total arsenic and hardness determination. The second liter was filtered in the field through a 0.45 μm filter prior to preservation, and analyzed for dissolved arsenic.

Sediment was collected from the Blackwater Branch, the Maurice River, and Union Lake. An Ekman dredge was utilized for sample collection at all sampling locations. Material from the upper 15 cm (six inches) of sediment was collected, and placed in a stainless steel bucket. Extraneous material, such as rocks and large fragments of vegetative matter, were removed, and the remaining sample thoroughly blended and transferred to the appropriate sample containers and submitted for grain size, total

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organic carbon, and arsenic analysis.

The grain size data was analyzed to determine the mean particle size and sorting value utilizing the normal probability curve methodology detailed by Falk (1974). The mean particle size is a measure of central tendency and is used to compare sampling locations. The sorting value is a measure of the uniformity of particle sizes or the range of particle size classes at a particular location. It is expressed in phi units, which are a logarithmic transformation of the Wentworth Size Class Scale. A low sorting value indicates uniform particle size whereas a high sorting value indicates a wide range of particle sizes.

In-situ water quality was determined with a Hydrolab Surveyor II. Parameters measured included dissolved oxygen, conductivity, pH, oxidation-reduction potential, temperature and salinity.

The benthic invertebrate community was sampled at each location in the Blackwater Branch and Maurice River. While similar habitat was sampled at all locations, we were unable to match sampling sites in the Maurice River with sites in the Blackwater Branch because of the differences in physical characteristics. The differences between the Maurice River and the Blackwater Branch therefore, necessitated separate analysis. Organisms were collected from three areas at each sampling location with a long-handled dip net approximately 30 centimeters (cm) high, by 25 cm wide, with 500 μ m mesh openings. In order to collect a quantitative sample and permit comparison of locations, an equivalent level of effort (in terms of time and area sampled) was expended at all sampling locations. A sample area of approximately 0.75 square meters was disturbed for 30 seconds. Organisms were collected by disturbing the substrate and vegetation upstream of the sampler, and dislodged organisms were swept into the net by the current and action of the sampler. Faunal collections were given a cursory examination in the field, and large debris and stones separated from the organisms. The remaining material was placed in 32 ounce jars, and preserved with a four percent buffered formalin solution.

The samples were returned to the laboratory where the organisms were separated from detritus using wet sieving, and sugar flotation techniques (Jonasson, 1958; Anderson, 1959; Lind, 1979). Rose bengal stain was added at a concentration of approximately 100 mg/l to aid in the separation process (Mason and Yovich, 1967). The organisms were identified to the lowest taxonomic level practical utilizing the taxonomic references developed by Edmunds et.al., 1976; Wiggins, 1977; Pennack, 1978; and Merrit and Cummins, 1984. Varying levels of taxonomic resolution were attained; separations ranged from order to genus, with most identifications made to the generic level. The size and life history stage, number of individuals, level of effort required, and state of taxonomic knowledge of the group determined the level of identification attained.

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Community structure was summarized utilizing methodology detailed in Bower and Zar (1984). A number of diversity indices including a) number of taxa and individuals, b) species richness, c) species diversity, and d) species evenness were calculated. Margalef's index is based on the number of taxa present, or the taxonomic richness of a biological community. It is expressed as:

$$d = \frac{(s-1)}{\log N}$$

where d is the measure diversity, s is the number of taxa, and N is the total number of individuals. Higher values indicate greater species diversity or richness.

Simpson's index also incorporates the number of taxa and total number of individuals, but additionally considers the distribution of individuals among taxonomic units. It is expressed as:

$$D = 1 - \frac{n_i(n_i-1)}{N(N-1)}$$

where D is the measure of diversity, n_i is the number of individuals in taxonomic unit i , and N the total number of individuals. This index is a measure of the probability of withdrawing two individuals of different taxa from a community at random. The probability of selecting two different taxa from a community with high diversity is great and is thus a measure of diversity. A higher value will indicate a greater probability of selecting two different taxa.

The Shannon index of diversity is based on information theory. It is expressed as:

$$H' = - \sum P_i \ln P_i$$

where H' is the diversity index when:

$$P_i = \frac{n_i}{N}$$

and P_i is the proportion of the total number of individuals occurring in species i , n_i is the number of individuals in taxonomic unit i , and N is the total number of individuals. The value calculated is a measure of the ability to predict the identity of an individual randomly selected from a community.. In a community with high diversity the degree of uncertainty associated with the selection will be high. Conversely, low uncertainty is associated with low diversity.

Evenness is a measure of the distribution of individuals among taxonomic units. It is a comparison of the distribution of individuals among taxonomic units in the observed community to a

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theoretical distribution. Because the Simpson and Shannon indices incorporate an evenness function into the expression, these values are compared to a theoretical maximum diversity expressed for the Simpson diversity value as:

$$D_{\max} = \frac{s-1}{s} \frac{N}{n-1}$$

and for the Shannon diversity value as:

$$H'_{\max} = \ln s$$

where D_{\max} and H'_{\max} are the theoretical maximum diversity values for the respective indices, N is the number of individuals, and s is the number of taxa. D_{\max} and H'_{\max} express an even distribution of individuals among taxa. Evenness is a measure of the nearness of the observed value to the calculated value and is expressed as:

$$E = \frac{D}{D_{\max}}$$

for the Simpson diversity value and:

$$J' = \frac{H'}{H'_{\max}}$$

for the Shannon diversity value where E and J' are the respective evenness values. A value of 1.000 will indicate complete agreement with the theoretical distribution.

A frequency distribution of the numerical abundance of taxa was plotted for each location to visually compare community structure. The X-axis is segmented into geometric abundance intervals. Each interval represents twice the number of individuals as the previous interval, and therefore is a logarithm of abundance. The Y-axis represents the number of species per interval. Inferences can be drawn from the characteristics of the diversity-density distributions generated concerning relative diversity and evenness at each location.

Analysis of the functional integrity of the benthic invertebrate community involved a descriptive summary of functional feeding groups. The classification of an organism into a group was based on morphological mechanisms of food acquisition, behavioral characteristics of an organism, and the physical/biochemical characteristics of the food item. Taxa were assigned a feeding group based on literature descriptions of mouth parts, gut contents, and ecology as summarized in Table 2. In some cases, the degree of taxonomic resolution did not permit the placement of a taxa into a single group. In this case, fractional shares for that taxa were assigned to each potential feeding group. Poor taxonomic resolution, coupled with the diversity of feeding groups, excluded the Chironomidae from this analysis. As a

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result, one less taxonomic unit was included in this analysis at locations where this taxa was collected.

As indicated in Table 2, six functional feeding groups are considered, including shredders, collectors, scrapers, predators, piercers, and miscellaneous omnivores. Shredders consume coarse particulate organic matter composed primarily of living and decomposing vascular plant material. The microflora associated with this material is an important component of the total energy assimilated by this group. Collectors feed on fine particulate organic matter either by filtering this material from the water column, or by gathering it from deposits and sediments. Scrapers feed on periphyton attached to mineral and organic material. Periphyton is composed primarily of attached algae such as diatoms. Predators are secondary consumers feeding on living animal tissue. Piercers consume fluids from living vascular hydrophyte cells and tissues. Miscellaneous omnivores are a loose assemblage of organisms that do not fit into one of the groups described above; included are deposit feeders and opportunistic scavengers.

Statistical analysis of the numeric abundance of benthic invertebrates collected from the Blackwater Branch was performed to determine the proportion of variability that can be accounted for by sample location. A general linear models procedure was followed, and the analysis was restricted to taxa that were represented by two or more individuals at a particular location. This resulted in a pattern of ecologically significant taxa which accounted for the majority of individuals collected. Additionally, sample locations were clustered on the basis of similarity of composition and abundances of invertebrates collected. Ward's minimum variance cluster analysis was employed with the semipartial R-square value utilized as an index of association.

Approximately 2.5 gallons of sediment were secured at each location for laboratory toxicity testing. The green algae Seleniastrum capricornutum, the cladoceran Daphnia magna, and the amphipod Hualella azteca were selected as the surrogate species for this phase of the study. S. capricornutum was utilized for elutriate phase testing and D. magna and H. azteca were utilized for single-species solid phase testing. The latter two organisms were also utilized in a solid phase multispecies toxicity test. Test procedures and data analysis followed the guidelines detailed by the U.S. Environmental Protection Agency/Army Corps of Engineers (1977), Nebeker et.al.,(1984), and US EPA (1985, 1985a).

All field sampling conducted during this project was completed in accordance with US EPA accepted methodology. Samples were individually documented with a field data sheet and were packed and transported to the laboratories under chain-of-custody and custody seal methods. Laboratory analysis and toxicity testing utilized methodology approved by the US EPA. Subcontractor

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reports and all REAC reports generated by this project received an internal QA/QC review by REAC Sampling and Analytical, Operations and Assessment, and/or Quality Assurance Staff.

RESULTS

Description of Study Area

The study area consists of the waterbodies adjacent to, and downstream of, the Vineland Chemical Site. These include the Blackwater Branch, the Maurice River, and Union Lake, an impoundment of the Maurice River.

Surface hydrology of the study area is characterized by relatively closely-spaced, parallel flowing tributaries that enter the Maurice River at consistent acute angles. Drainage is to the south, ultimately entering the Delaware River. As a result of the very low topographic gradient in the region, the streams are slow moving and shallow. No well defined riffle areas exist and the flow is mostly laminar; the channel consists of a network of braided rivulets in places. In addition, the substrate typically consists of sand to silt-sized particles.

The water was generally transparent, while appearing light brown to tea-colored. This coloration results from an abundance of organic iron complex that is derived from the oxidation of iron ions dissolved in the groundwater that mix with the decomposing plant materials upon entering surface water. Surface water in the region is generally low in hardness, alkalinity, and suspended and dissolved solids. It is acidic and is nutrient poor (Pinelands Commission, 1980).

The land adjacent to the waterbodies is typically vegetated with a secondary growth forest. Atlantic white cedar, red maple, bay magnolia, and pitch pine are the dominant canopy species. Blueberry, sweet pepperbush, American holly, Mountain laurel, and spice bush are present in the understory. Agriculture, consisting of vegetables, fruit orchards, and nursery stock, are common throughout the region.

The numerical designations and sample locations in the Blackwater Branch and the Maurice River conform to those established in the RI/FS conducted for the US EPA Region II; those in Union Lake are newly established locations. The ERT prefix was added to identify the data generated as unique to this study. Sampling locations, ERT-2, ERT-4, ERT-5, ERT-6, and ERT-8 are lotic environments, whereas ERT-9, ERT-10, and ERT-11 are lentic environments.

Blackwater Branch at ERT-2 occupies a well defined channel, ranging in width from 5 to 12 meters with a maximum observed depth of 30 cm. The substrate appeared well sorted, and was composed of medium to coarse sand with infrequent stones. Vegetation on the north bank consisted of secondary growth

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forest. The south bank was also forested, however, there were patches of mowed turf and agricultural areas that are maintained by adjacent residents. Canopy cover ranged from 80 to 100 percent. Submerged and emergent aquatic vegetation was present.

The channel of Blackwater Branch at ERT-4 is fairly well defined, although the stream banks are severely undercut and poorly developed in a number of areas east of Mill Road. This most likely was the result of recent beaver damming activity, which had flooded a broad area on the south bank of Blackwater Branch east of Mill Road. The beaver dam has recently been removed, exposing the stream bank and adjacent flood plain. The substrate at this location consists of fine to very fine sand. Most of the vegetation on the south flood plain, east of Mill Road, has been killed, possibly as a combined result of prolonged inundation and arsenic toxicity. There is no canopy cover in the area which is presently littered with dead stems of Atlantic white cedar, pitch pine, and red maple. Submerged macrophytes were common.

The Blackwater Branch at ERT-5 is confined to a well-defined stream channel approximately two meters in width and one to two meters in depth. The substrate is composed of medium to fine sand. Submerged vegetation was present, the stream banks were completely forested, and canopy cover was 100 percent.

In the vicinity of ERT-6, the Maurice River is approximately five meters wide and in excess of one meter deep. The channel, however, broadens at the Garden Road overpass to approximately 10 meters in width. The substrate consists of medium to fine sand. The stream banks were well defined and undercut in places, and an extensive littoral zone was not present. The stream banks were completely forested and canopy cover ranged from 20 to 60 percent. Submerged macrophytes were common.

The Maurice River at ERT-8 is approximately 15 meters wide with a maximum observed depth of two meters. The substrate is composed of fine sand. The streambanks and adjacent floodplain are vegetated with a hardwood forest and the canopy cover ranged from 40 to 60 percent. The western floodplain was lower in elevation than the eastern and as a result, was flooded at the time of the investigation. A small unnamed tributary of the Maurice River is present north of Landis Avenue. This waterbody flows from the west and may discharge runoff from the newly constructed Highway 55 into the Maurice River. Recreational fisherman were present who described a typical warm water fishery that included species such as bass, sunfish, and pickerel. In addition, a cold water trout fishery, artificially maintained by the NJ DEP Division of Fish, Game, and Shellfish, was present.

Union Lake is an 800 acre impoundment of the Maurice River. At the time of the investigation, the water level had been substantially lowered to permit required repairs to be made on the dam and spillway. The existing shoreline at the southeastern end of the lake had receded approximately 100 meters into the

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lake basin. The substrate in Union Lake graded from a coarse sand at the northern end to a fine sand at the southern end. The exposed substrate was littered with shells of Corbicula fluminea. Anodonta sp. was also present, but in fewer numbers.

Water Quality

Concentrations of the various arsenic fractions followed a similar trends, with the lowest concentrations detected at the two reference locations (ERT-2 and ERT-6), and the highest concentrations detected immediately downstream of the site (ERT-4 and ERT-5) (Table 3, Figure 3). The arsenic concentrations decreased at locations progressively further downstream. The concentration of total arsenic ranged from 460 ug/l at sampling location ERT-5 to nondetectable at reference locations ERT-2 and ERT-6. The concentration of dissolved arsenic was 290 ug/l immediately downstream of the Vineland Chemical facility at sampling location ERT-4 and nondetectable at reference locations ERT-2 and ERT-6. The arsenic detected was largely present in the dissolved fraction, ranging from 45 percent at location ERT-5 to 71 percent at ERT-4. Total hardness values ranged from 12 mg/l to 19 mg/l.

Levels of all water quality parameters measured did not deviate significantly with respect to the Vineland Chemical Site with the exception of conductivity (Table 4). The values measured at the Blackwater Branch reference location (ERT-2) was 0.100 micromho per centimeter (mmhos/cm) and the values downstream of the site were 0.150 and 0.147 mmhos/cm at locations ERT-4 and ERT-5, respectively. Conductivity in the Maurice River was measured at 0.141 and 0.145 mmhos/cm at locations ERT-6 and ERT-8, respectively, indicating no deviation in this parameter with respect to the Blackwater Branch.

Sediments

Arsenic concentrations detected in the sediments followed a trend similar to that observed in the water (Table 5). The highest concentrations were found in the Blackwater Branch immediately downstream of the Vineland Chemical Site. The concentrations at locations ERT-4 and ERT-5 were 14,000 and 1,600 mg/kg, respectively. The two upstream reference locations, ERT-2 and ERT-6, had arsenic concentrations of 5.7 and 1.7 mg/kg, respectively. The arsenic concentration decreased at locations progressively distant from the source, ranging from 480 mg/kg at location ERT-8 to 13 mg/kg at ERT-11. Total organic carbon ranged from 2.7 to 9.4 percent in the lotic environments and from 0.0078 to 1.4 percent in the lentic environment.

Mean particle size ranged from 0.12 millimeters (mm) at ERT-4 to 0.80 mm at ERT-9. The sorting value ranged from 1.12 phi units at ERT-10 to 3.74 phi units at ERT-11. The sorting value remained relatively consistent within the lotic waterbodies sampled; ranging from 2.17 to 2.21 phi units in the Blackwater

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downstream from the Vineland Chemical Site were reduced, ranging from 29 percent at ERT-4 to 78 percent at ERT-5. Survival rates returned to reference levels at site ERT-8 (93 %). Mean survival of H. azteca in sediments collected from ERT-4 was statistically different from mean survival in sediments collected from other locations ($P < 0.05$). Although survival was reduced at location ERT-5, it was not statistical different than survival at locations ERT-2, ERT-6, or ERT-8 ($P > 0.05$).

The Daphnia magna solid phase test results showed no significant differences among locations when evaluated based on the survival of adult D. magna or the production of young (Table 11). It should be noted that the water utilized in these tests were not water samples from the Vineland site. The water was diluent water provided by the laboratory from their on-site well in Gainesville, Florida. Sediment contribution to the water column would be the route for contamination and as the contaminant is a metal significant contamination of the water column in this type of test was not anticipated.

One replicate of the H. azteca test and one replicate of the D. magna test were conducted in the same vessel to determine relative toxicity and if the organisms are compatible. Both organisms are subject to the same test conditions thus permitting multispecies comparisons to be made with greater confidence. There was no indication that the two species are not compatible, although the toxicity test results were variable, the data indicates that the test does have a relationship to the individual tests (Table 11).

Survival of H. azteca in the control vessels were 29 and 20 percent for replicates one and two, respectively. The substrate utilized in these tests was composed of clean coarse sand. Although the literature suggests that particle size is not a critical factor, the nature of the sand with respect to micronutrient content and other physico-chemical characteristics may have contributed to the depressed survival rates. Further tests by the subcontractor determined that the control mortality was the result of a lack of organic nutrients in the control sediments. The utilization by ERT of upstream reference locations allowed the acceptance of the H. azteca results despite the failure of the laboratory control sediments. The control vessel, in which both H. azteca and D. magna were tested concurrently developed a fungal growth. This did not appear to contribute to the low survival rates of the H. azteca, as the results in this replicate were similar to those obtained in replicate one, however, the D. magna appeared to be adversely affected. Survival in the other D. magna control was 100 percent.

The subcontract laboratory experienced problems relating to Selenostrom capricornutum culture media. As a result, the data obtained utilizing this organism for elutriate phase testing did not pass the QA\QC review and were not accepted for this study.

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TAXONOMIC diversity downstream of the site was reduced as indicated by the number of taxa and Margalef's index. Both the Simpson and Shannon indices, however, indicated an increase in diversity in the Blackwater Branch between ERT-2 and ERT-4. This is a manifestation of the mathematical manipulations of the data and not a true indication of community structure. As discussed, the Simpson and Shannon indices are based on probability and information theory. Additionally, some locations (i.e., ERT-2, ERT-5, and ERT-8) had one or two taxa represented by a disproportionately high number of individuals. The presence of 365 individuals of Gammarus sp. at ERT-2 resulted in a low probability of selecting two different taxa at random with respect to Simpson's index, and a high likelihood of predicting the identity of a randomly withdrawn individual with respect to the Shannon index. In the absence of Gammarus sp. at ERT-2, the Simpson and Shannon indices would be 0.876 and 2.393, respectively.

There are distinct differences in the characteristics of the diversity-density distribution curves generated for each location (Figure 5). Sampling locations ERT-4, ERT-5, and ERT-8 have flatter curves than those generated for locations ERT-2 and ERT-6. This indicates that there are more taxa present at the latter locations. Additionally, the peaks of the curves generated for locations ERT-4, ERT-5, and ERT-8 appear to be shifted to the left and the tails spread out further than those for location ERT-2 and ERT-6 suggesting there are fewer individuals in each taxa and more unevenness in the distribution of individuals among taxa. The relative arrangement of the curves, ERT-6 and ERT-2 in uppermost positions, ERT-4 and ERT-5 in lowermost positions, and ERT-8 in an intermediate position reflect environmental quality with respect to arsenic concentration.

Statistical analysis of the benthic invertebrate data included an analysis of variance (ANOVA) and R-square values (Table 9). The probability values are an estimate of the likelihood that the observed distributions could have occurred by chance, rather than by natural or man-induced deterministic mechanisms specific to each location. Values less than 0.05 are a strong indication that the distribution is not the result of chance. The R-square value is a measure of the percent of variability in the observed distribution that can be accounted for by location specific variables including the degree of contamination.

Comparisons of the variance within each sample, collected in the Blackwater Branch, showed significant differences ($P < 0.05$) (ANOVA) (Table 9). A comparison of the locations indicate that the differences between ERT-2 and ERT-4, ERT-2 and ERT-5, and ERT-2 and ERT-4 and ERT-5 (upstream vs. downstream), is also statistically significant ($P < 0.05$). The R-square values correspond well with the probability values and suggest that the variability observed is a result of location specific variables.

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Ten taxa (Heterocordula, Calopteryx, Polycentropus, Oecetis, Parapoynx, Hirudinea, Physa, Palamonetes, Asellus, and the Chironomidae) had high probability and correspondingly low R-square values. This strongly suggests that the observed distributions are not the result of location, but rather due to chance or other variables. The contrast between the upstream and downstream locations were, with the exception of Calopteryx, were not statistically significant indicating that the distributional mechanisms were similar at the locations sampled.

Faunal homogeneity among sampling sites reflects a strong spatial separation between locations ERT-2, ERT-4 and ERT-5, and ERT-6 and ERT-8 (Figure 6). The strongest similarity is evident in cluster A, which joins locations ERT-4 and ERT-5. This may be a reflection of the depauperate nature of the benthic communities at these locations. ERT-8 joins cluster A next, followed almost immediately by ERT-6 forming clusters B and C, respectively. The close association between clusters B and C, ERT-8 and ERT-6, respectively, may be a function of habitat rather than degree of contamination. The final addition to the parent cluster is location ERT-2. The wide separation between this location and clusters A and C reflects both the degree of contamination as well as the habitat differences between the Blackwater Branch and the Maurice River.

Benthic Invertebrate Community Functional Analysis

Six functional feeding groups were present in the collection (Figure 7, Table 10). Predators are the dominant group and were collected from all locations. Representation ranged from 26 percent at location ERT-2 to 39 percent at ERT-6. Collectors are the next most abundant group and range in representation from 17 percent at locations ERT-6 to 35 percent at ERT-8. Piercers were present in significant numbers only at location ERT-4 and represented 21 percent of the taxa. Significant in their presence at ERT-2 and their absence at locations ERT-4 and ERT-5 are the shredders and scrapers; no taxa collected at these locations were members of either group.

Analysis of variance revealed that the observed distributions of eight taxa collected upstream of the Vineland Chemical Site were statistically different ($P > 0.05$) than the distributions observed downstream. Of this total, five are shredders, one is a collector, and two are miscellaneous omnivores. Ten taxa displayed a very low statistical relationship between sample location and distribution. Of these, five are predators, one is a shredder, and four are miscellaneous omnivores.

Toxicity Testing

The mean survival rates for the Hyalella azteca 10 day solid phase tests range from 42 percent at location ERT-4 to 93 and 91 percent at the reference locations ERT-2 and ERT-6 respectively (Table 11). Mean survival at the locations immediately

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Branch, and from 1.79 to 1.93 phi units in the Maurice River. As noted previously, the Maurice River and the Blackwater Branch were analyzed separately due to differences in physical parameters. The sediments in Union Lake ranged in sorting value from 1.12 phi units at ERT-10 to 3.74 phi units at ERT-11.

Benthic Invertebrate Community Structural Analysis

The number of benthic invertebrates collected ranged from 105 at location ERT-6 to 589 at location ERT-2 (Tables 6 and 7). High numerical abundance was observed at locations ERT-2, ERT-5, and ERT-8 and relatively low abundance at locations ERT-4 and ERT-6. The observed high densities of individuals at ERT-2, ERT-5, and ERT-8 are primarily the result of a numerical dominance of one or two taxa at each of these locations (Table 6). At location ERT-2, Gammarus sp. accounts for 61.2 percent of the individuals collected; at location ERT-5 Asellus sp. accounts for 52.7 percent of the individuals collected; and at ERT-8 Gammarus sp. and Pseudocloeon sp. together account for 78.6 percent of the individuals collected. The dominance of Pseudocloeon sp. at ERT-8 is most likely the result of a recent hatch, as most of the individuals collected were early instars, and the observed abundance merely a reflection of the resultant patchy distribution. In the absence of the numerically dominant taxa, the number of individuals at locations ERT-2, ERT-5, and ERT-8 are 224, 264, and 104 individuals, respectively.

A total of 46 different taxa were collected at the five locations sampled. The dominant group, in terms of number of different taxa, are the Tricopterans (caddisflies). Fourteen genera were collected, although they were found predominantly at locations ERT-2 and ERT-8. The Molluscs (snails and bivalves) were the second most abundant taxonomic group, and were represented by six taxa. This group, however, was more evenly distributed throughout the study area; it was represented by at least one taxa at each location. The number of taxa was greatest at the reference stations ERT-2 and ERT-6. Twenty-four different taxa were present at each of these locations. The number of taxa were significantly reduced in the Blackwater Branch downstream of Vineland Chemical Site to 15 and 12 taxa at locations ERT-4 and ERT-5 respectively. Recovery, in terms of taxonomic abundance, was evident at station ERT-8 where 18 taxa were collected.

A number of taxa were not sensitive to the changes that occurred in the Blackwater Branch downstream of the Vineland Chemical Site. Ameletus sp. increased in abundance from three individuals at location ERT-2, to 10 at ERT-4, and 29 at ERT-5. This pattern was also observed in the family Simuliidae (blackflies), the family Sphaeriidae (fingernail clams), Physa sp., and Asellus sp. Other organisms that did not appear to be adversely effected include Polycentropus sp., the family Plecoptera (stoneflies), and the family Chironomidae (midge).

The family Ephemeroptera (mayflies), with the exception of

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Ameletus sp., and the caddisflies, with the exception of Polycentropus sp., were substantially reduced in number downstream of the Vineland Chemical Site. Four mayfly genera and nine caddisfly genera were collected at location ERT-2, and only one mayfly genera (Ameletus sp.) and two caddisfly genera were collected at ERT-4 and ERT-5. One of the caddisfly genera (Hydroptila sp.) collected at ERT-5 was not collected at any other location, and was represented by only one individual in the entire collection.

Margalef's index incorporates both the number of species and the number of individuals (Table 8). The values obtained ranged from 4.005 at location ERT-5 to 11.379 at location ERT-6. Because this index is simply a measure of species richness, it closely parallels the number of taxa collected at each location (Figure 4). A ranking of sampling locations from the least to the most diverse would be ERT-5, ERT-4, ERT-8, ERT-2 and ERT-6. This ranking roughly reflects the arsenic concentrations detected and may indicate a potential stress this contaminant is having on the biological community.

Simpson's index also incorporates the number of taxa and total number of individuals, but additionally considers the distribution of individuals among taxonomic units. The values obtained for this measure ranged from 0.599 at location ERT-2 to 0.854 at ERT-6. A ranking of the locations from the least to the most diverse would be ERT-2, ERT-5, ERT-8, ERT-4, and ERT-6. This ranking does not parallel either the number of taxa or the Margalef index (Figure 4), nor does it reflect the concentration of arsenic detected at the various locations. Additionally, it indicates that the benthic community at locations ERT-4, ERT-5, and ERT-8 are more diverse than at the reference location ERT-2.

The Shannon index of diversity is based on information theory, and the values calculated range from 1.448 at location ERT-5 to 2.341 at location ERT-6. A ranking of the locations from the least to the most diverse would be ERT-5, ERT-8, ERT-2, ERT-4, and ERT-6. This ranking roughly parallels the Simpson index (Figure 4), and similarly indicates lower diversity at ERT-2, located upstream of the Vineland Chemical Site than at ERT-4, located immediately downstream of the site.

The Simpson and Shannon diversity values consider both the number of species and the distribution of individuals among species. A measure of maximum diversity (number of species) and evenness (the distribution of individuals among species) can be calculated utilizing these indices. The evenness values calculated for the Simpson index range from 0.623 at ERT-2 to 0.883 at ERT-6. A ranking of locations from least to greatest agreement would be ERT-2, ERT-8, ERT-5, ERT-4, ERT-6. The range of values for the Shannon index is 0.495 at ERT-2 to 0.737 at ERT-6, and a ranking of locations from least to greatest agreement is identical to the Simpson ranking.

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DISCUSSION

The distribution of arsenic in the water and sediment indicate that the Vineland Chemical Site is the source of the arsenic contamination. Faust et.al., (1980) detected total arsenic concentrations in water collected from the Blackwater Branch downstream of the site ranging from 2,320 to 2,780 ug/l. Of this, roughly 97 percent was in the dissolved fraction. Total arsenic in the water progressively decreased with increasing distance from the site to 386 and 154 ug/l in the Maurice River and ranged from 28 to 78 ug/l in Union Lake. Dissolved arsenic remained the dominant fraction, typically ranging over 80 percent.

Faust et. al., (1980) also examined arsenic in both the pore water and solid sediment fraction, whereas this study examined only the total sediment content. The combined arsenic fractions detected in 1980 ranged from 14,790 to 1,447 mg/kg in the Blackwater Branch downstream of the site to 2,950 and 150 mg/kg in the Maurice River at locations progressively further downstream. Concentrations detected in Union Lake sediments ranged from 75 to 386 mg/kg. Comparison of the data collected during this study with existing data indicates that the arsenic contamination roughly approximates the extent and magnitude of that detected in 1980.

The concentration of total arsenic in water collected from the Blackwater Branch was an order of magnitude lower in this study than in 1980. Similarly, a smaller portion was present in the dissolved fraction. The larger particulate fraction may be attributed to arsenic associated with sediment materials that were introduced into the water column as a result of storm events that preceded and accompanied sampling. Approximately 0.10 inch of rain fell the day prior to sampling followed by 0.47 inch on the day the Blackwater Branch and the Maurice River were sampled and 0.65 inch on the day Union Lake samples were collected (National Weather Service). The concentration of total arsenic in water collected from the Maurice River and Union Lake was also lower than that detected in 1980, however the difference in the values were not as large as those in the Blackwater Branch. The concentration of arsenic detected in the sediments in this study were in the same range as in 1980.

The storm event most likely increased the concentration of the particulate fraction above that which occurs during dry weather conditions. Good correlations between contaminant content of the particulate fraction and discharge have been demonstrated under similar conditions (Wilber and Hunter 1977, 1979). The detected concentrations may be the result of arsenic enrichment from sources (i.e., sediment scouring, contaminated runoff and groundwater recharge) that only occur during storm events. Dry weather concentrations in the water column may be lower than those detected, and additional sampling prior to, following, and during storm events might provide additional insight concerning

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arsenic dynamics.

The study area can be partitioned into three distinct habitats on the basis of physical/chemical parameters measured, and observations made in the field. With the exception of arsenic contamination, these factors are a function of naturally occurring processes and play a major role in determining the distribution and abundance of organisms. As mentioned previously, the study area consists of both lentic (Union Lake) and lotic (Blackwater Branch and Maurice River) habitats. The physical differences between the two habitats as well as their proximity to the site warrant separation.

Observations made of the lotic habitats necessitated a further distinction between the Blackwater Branch and the Maurice River. Physical characteristics include grain size, discharge volume and velocity, and canopy cover, support this distinction. The sediment sorting values in the Blackwater Branch ranged from 2.17 to 2.21 phi units and from 1.79 to 1.93 phi units in the Maurice River. The ranges observed are a function of the discharge characteristics. Discharge velocity of relatively constant strength result in better sorting than fluxuating velocities. Although a quantitative determination was not made, the discharge of the Maurice River, by virtue of its greater size, will be more consistent than that of the Blackwater Branch. Extent of canopy cover is another consequence of channel size. The Maurice River has a larger extent of water exposed and consequently, a greater input of solar radiation than the Blackwater Branch. This can result in varying thermal budgets and rates of primary production in the two waterbodies.

The benthic invertebrate community resident in the Blackwater Branch exhibits a wide range in both the structural and functional parameters measured. The variations are most pronounced immediately downstream of the Vineland Chemical Site, and may be attributed to the contaminants that originate there; however the exact causal mechanism(s) has not been established. The biological community sampled is largely composed of insect larva with smaller numbers of adult insects, crustaceans, molluscs and annelids. The toxic response of these groups to arsenic is not well known. The literature indicates that there is a wide range of sensitivity of invertebrates to arsenic (Tables 12 and 13). The concentration at which an LC50 or EC50 can be observed when utilizing invertebrates as the surrogate species ranges from 812 ug/l (Simocephalus serrulatus) to 22,040 ug/l (Pteronarcys californica) (USEPA, 1980). Other toxicity data utilizing alternate observed effects encompass the wide range specified above. The range of arsenic concentrations detected in the various environmental compartments sampled in this study are within the same order of magnitude as the values included in Tables 12 and 13. It is likely, therefore that direct toxic impacts are at least partly responsible for the observed species abundance and distribution.

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The Blackwater Branch is functioning as a point source of arsenic contamination to the Maurice River. Downstream of the confluence, taxonomic diversity in the Maurice River was reduced as measured by all indices calculated. However, in contrast to the Blackwater Branch, the reduction in taxonomic diversity was not a result of a wholesale reduction in major taxonomic groups, but rather a partial exchange of one taxa for another. Thirteen taxa present at ERT-6 were absent from ERT-8, and seven taxa present at ERT-8 were absent from ERT-6. This resulted in a net loss of six taxa at ERT-8. It is possible that the observed distribution of organisms is a result of sampling at widely displaced positions on an environmental gradient. The presence of arsenic at ERT-8 may be a factor determining the observed distribution of invertebrates, however it does not appear to dominate. As indicated in Table 12 and 13, macroinvertebrates are generally tolerant of the range of arsenic concentrations detected at ERT-8.

Functional feeding groups are based on morpho-behavioral mechanisms of food acquisition that generally represent a wide range in food items. Intake of food items are limited by physical characteristics of the feeding and mouth parts of the organism, and the habits and behavior that manipulate the structures and position the organism in the appropriate location for encountering the food. The various feeding groups perform different functions within the aquatic community and ecosystem such as the cycling and processing of energy resources.

Functional processes associated with the utilization of organic matter by benthic invertebrates were altered in the Blackwater Branch downstream of the Vineland Chemical site. There was a shift in the relative abundance of the various functional feeding groups collected. Collections at ERT-2 showed an abundance of shredders (Figure 7, Table 10). In contrast, there are no shredders present at locations ERT-4 and ERT-5. This may be an indication that this particular group is more sensitive to arsenic than other groups. It is more likely, however, that a mechanism other than toxicity is determining the relative distribution of these groups. Relationships have established between shredders and coarse particulate organic matter in streams (Cummins, 1974). Furthermore, the selection of a food item may be based on quality. Those food items most densely populated with microbiota (i.e., fungi, bacteria, protozoans, and algae) may be preferentially selected over those with sparsely populated or no associated populations. In the case of the locations downstream of the Vineland Chemical Site, the microbial community may be the most sensitive portion of the stream biota to arsenic contamination and this impact measured as the absence of shredders.

The response of the scraper functional feeding group was similar to that observed in the shredders. There were no scrapers present at location ERT-4 and ERT-5, while at location ERT-2 they accounted for nine percent of the community. Likewise, a direct

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toxic impact may not be primary factor determining the observed distribution. The major food items of this group include attached aquatic plants, primarily nonvascular vegetation such as diatoms and other microflora. The abundance of scrapers has been directly related to the abundance of these organisms (and indirectly the rate of primary production) in a waterbody. A reduction in water quality has been shown to depress the rate of primary production, primarily as a result of a shift in species composition towards the less efficient organisms and a reduction in species diversity (Patrick 1949, 1971). The absence of scrapers, therefore may be a reflection of reduced rates of primary production, and a decrease in the nutritional quality of the aquatic flora.

The statistical analysis strongly supports the previous discussion concerning the distribution of functional feeding groups in the Blackwater Branch. The distribution of the shredding and scraping taxa displayed high levels of statistical significance with respect to location, whereas those of the other groups displayed low levels of significance. The distribution of available energy exploited by the various groups is reflected in the analysis of variance. Predators are positioned high in the food web and are typically present in lower numbers than primary consumers. As a result, the distribution of predators is a function of the availability of prey, which does not appear to vary with respect to location in the Blackwater Branch. The taxa with broad based nutritional dependencies, including the collectors and miscellaneous omnivores, likewise displayed poor statistical significance with respect to location. This appears to be a function of the availability of food items as well as the ability of the organism to exploit a variety of items.

The relative distribution of taxa in the various functional feeding groups collected from the Maurice River did not change dramatically with respect to the Blackwater Branch confluence. The collector group increased primarily as a result of an increase in the caddisfly genera, and the predators and piercers were reduced. This follows the structural changes observed; there was a moderate reduction in all groups collected, and contrasts the changes observed in the Blackwater Branch where some groups were completely eliminated downstream from the site.

The toxicity data generated in the laboratory indicates that the organisms intimately associated with the sediments are most likely to be directly impacted by arsenic. When exposed to sediments collected at ERT-4, Hyalella azteca exhibited reduced survival in the solid phase tests. The concentration of arsenic at ERT-4 was 14,000 mg/kg and resulted in a 58% mortality rate. Unfortunately, most tests on arsenic toxicity have been run on the water column. While these tests are not directly applicable they do present an interesting comparison. A water column LC50 value of 879 ug/l arsenic has been established for Gammarus pseudolimnaeus, (USEPA, 1980) a species ecologically equivalent to H. azteca. Other studies utilizing this species have resulted

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in a 80 percent mortality of the test population after a seven day exposure to 961 ug/l arsenic. A test population of H. kickerbockeri, another ecological equivalent, exhibited 70 percent mortality when exposed to 4,469 ug/l arsenic. Although the studies cited above were conducted in the aqueous phase, these results, in conjunction with those generated in this study, indicate that the sediments in the vicinity of the Vineland Chemical Site are exerting a toxic impact.

The field collection supports the laboratory data. Gammarus sp. and Asellus sp. are ecological equivalents of H. azteca; all three taxa inhabit and feed on the sediment material. A large population of Gammarus sp. was present at ERT-2, as indicated by the number of individuals collected at this location. The number of individuals collected at ERT-4 and ERT-5 was nine and 81 respectively. This distribution may reflect a toxic or avoidance response at ERT-4 followed by partial recovery or a reduction in the response at ERT-5. Although Asellus sp. was not collected at ERT-2, it followed the same distributional pattern as Gammarus sp. at locations ERT-4 and ERT-5.

CONCLUSIONS

The arsenic contamination in the sediments in the Blackwater Branch of the Maurice River is having a significant impact on the benthic invertebrate population downstream of the Vineland site. While an impact can be detected in the Maurice River the impact is greatly reduced most likely due to the flow rates in the river. The impact seen in the benthic study is confirmed by the toxicity testing. Mortality in the species tested was significantly elevated in ERT-4 the station downstream of the Vineland site. Both of these tests, which showed significant impacts to the environment, correlate to the high levels of arsenic contamination.

The arsenic concentrations detected at locations ERT-4 and ERT-5 exceed the 50 ug/l drinking water standard established by the NJ DEP and the US EPA.

This study has shown that the contamination of the Blackwater Branch is presenting a present adverse impact on the populations in the stream. It is our opinion that steps should be taken to mitigate the Blackwater Branch where arsenic concentrations are presenting a toxic hazard to the environment.

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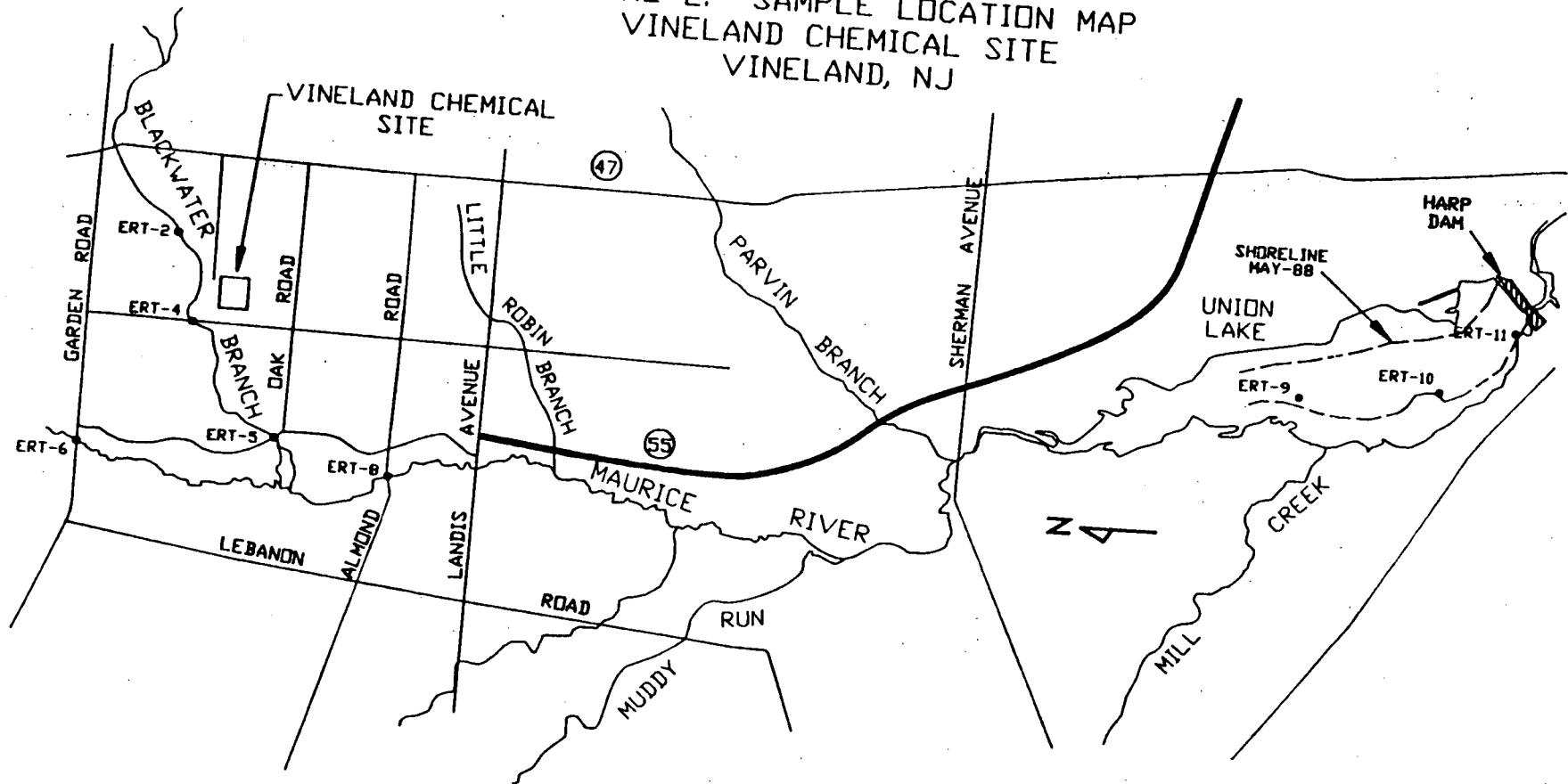


FIGURE 1. SITE LOCATION MAP
VINELAND CHEMICAL SITE
VINELAND, NJ

Source: Newfield, NJ and Millville, NJ USGS Quadrangles, Scale 1:24000

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FIGURE 2. SAMPLE LOCATION MAP
VINELAND CHEMICAL SITE
VINELAND, NJ



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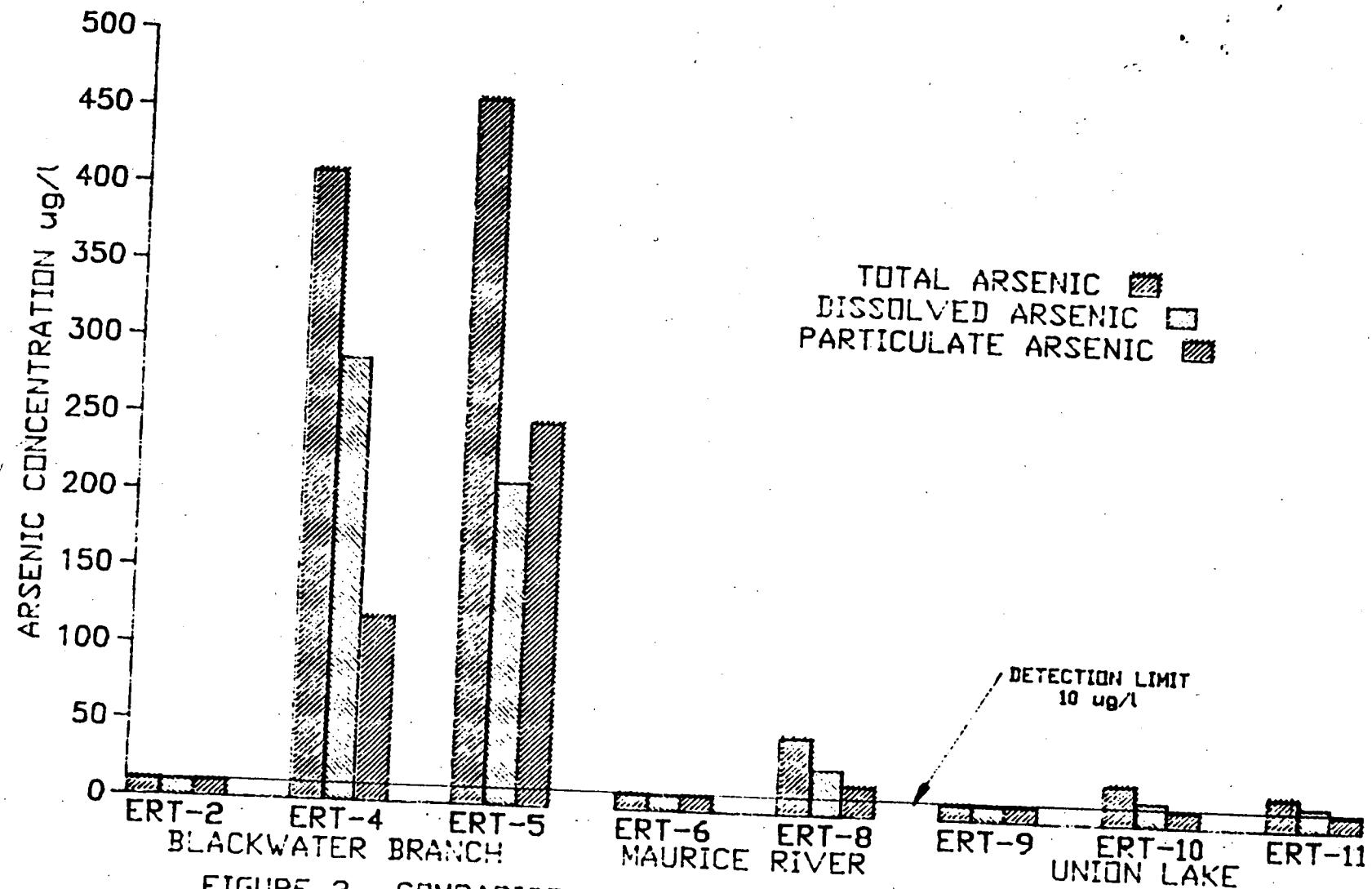
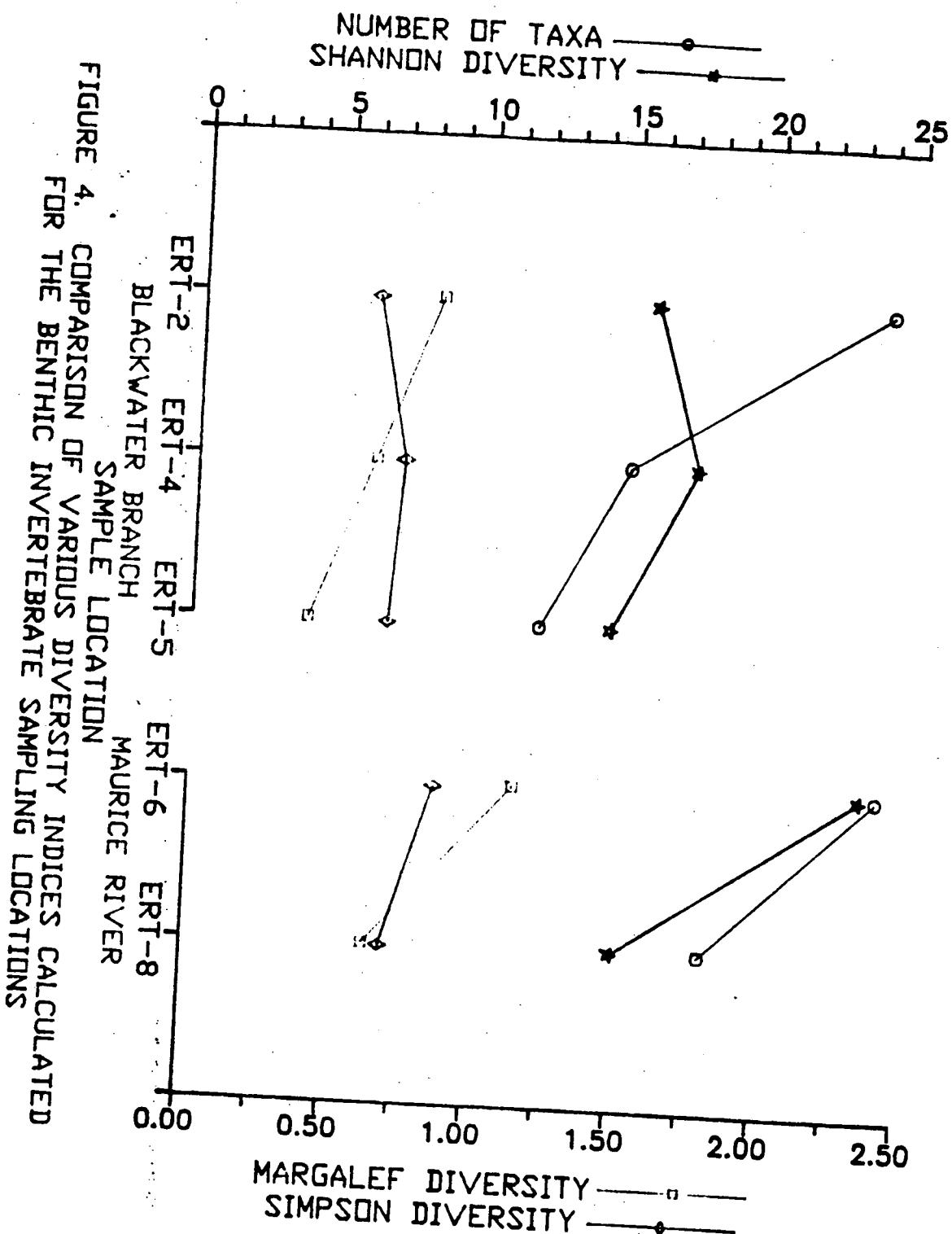


FIGURE 3. COMPARISON OF ARSENIC CONCENTRATIONS IN VARIOUS FRACTIONS AT WATER SAMPLING LOCATIONS

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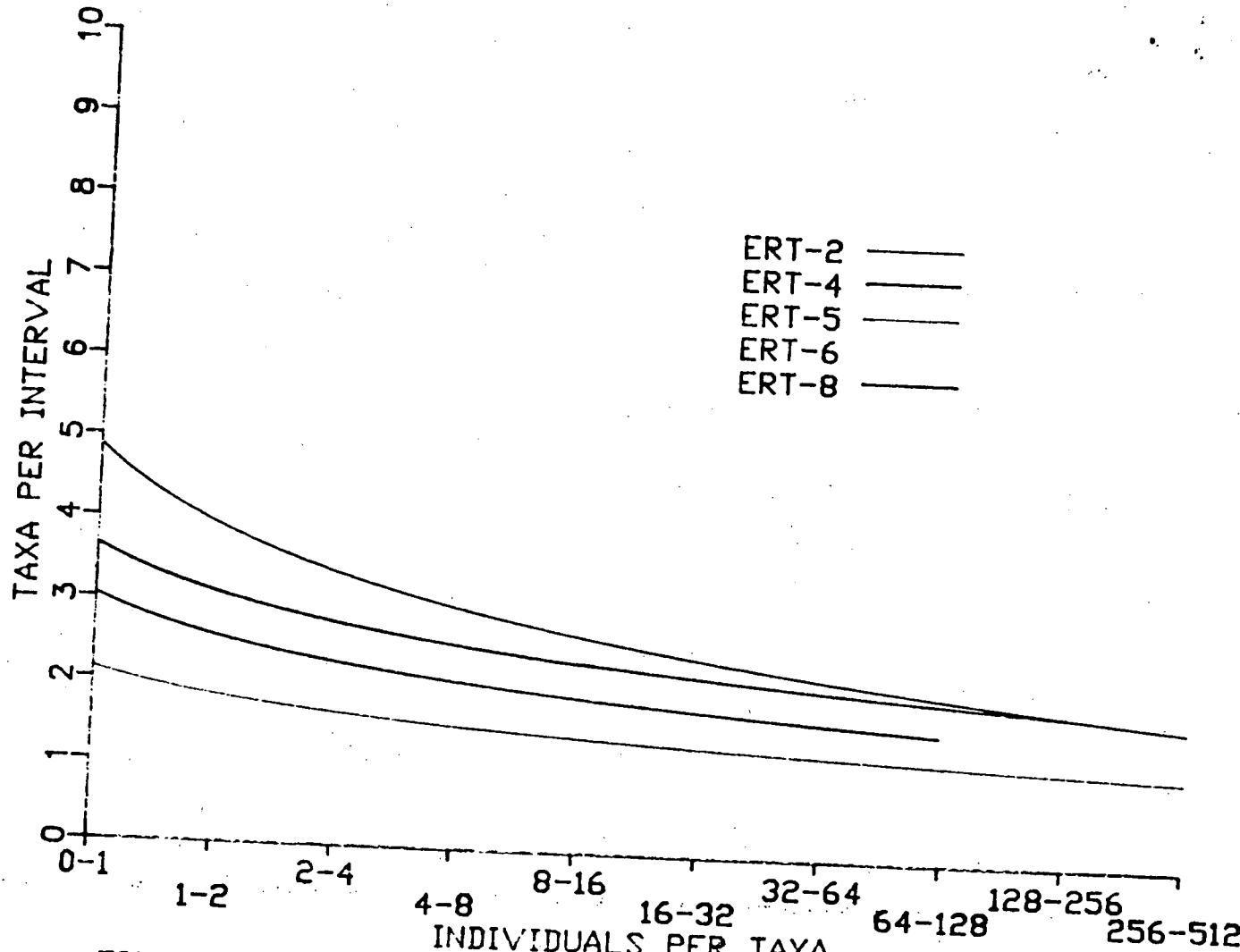


FIGURE 5. COMPARISON OF DIVERSITY-DENSITY DISTRIBUTIONS
FOR THE BENTHIC INVERTEBRATE SAMPLING LOCATIONS

1511 - 600 NIA

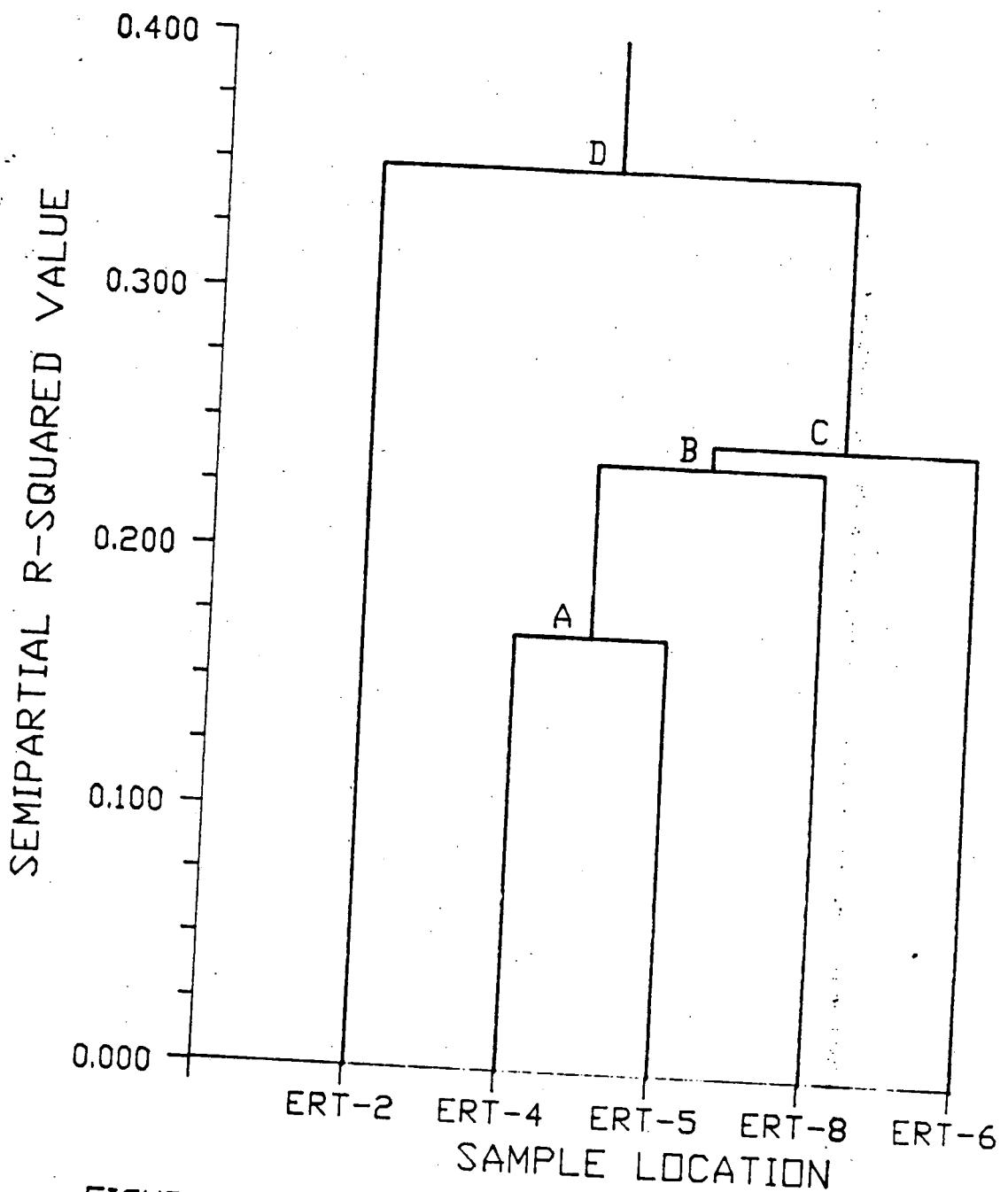


FIGURE 6. DENDROGRAM GENERATED FROM WARD'S
MINIMUM VARIANCE CLUSTER ANALYSIS OF
BENTHIC INVERTEBRATE DATA

ESII ECO MTA

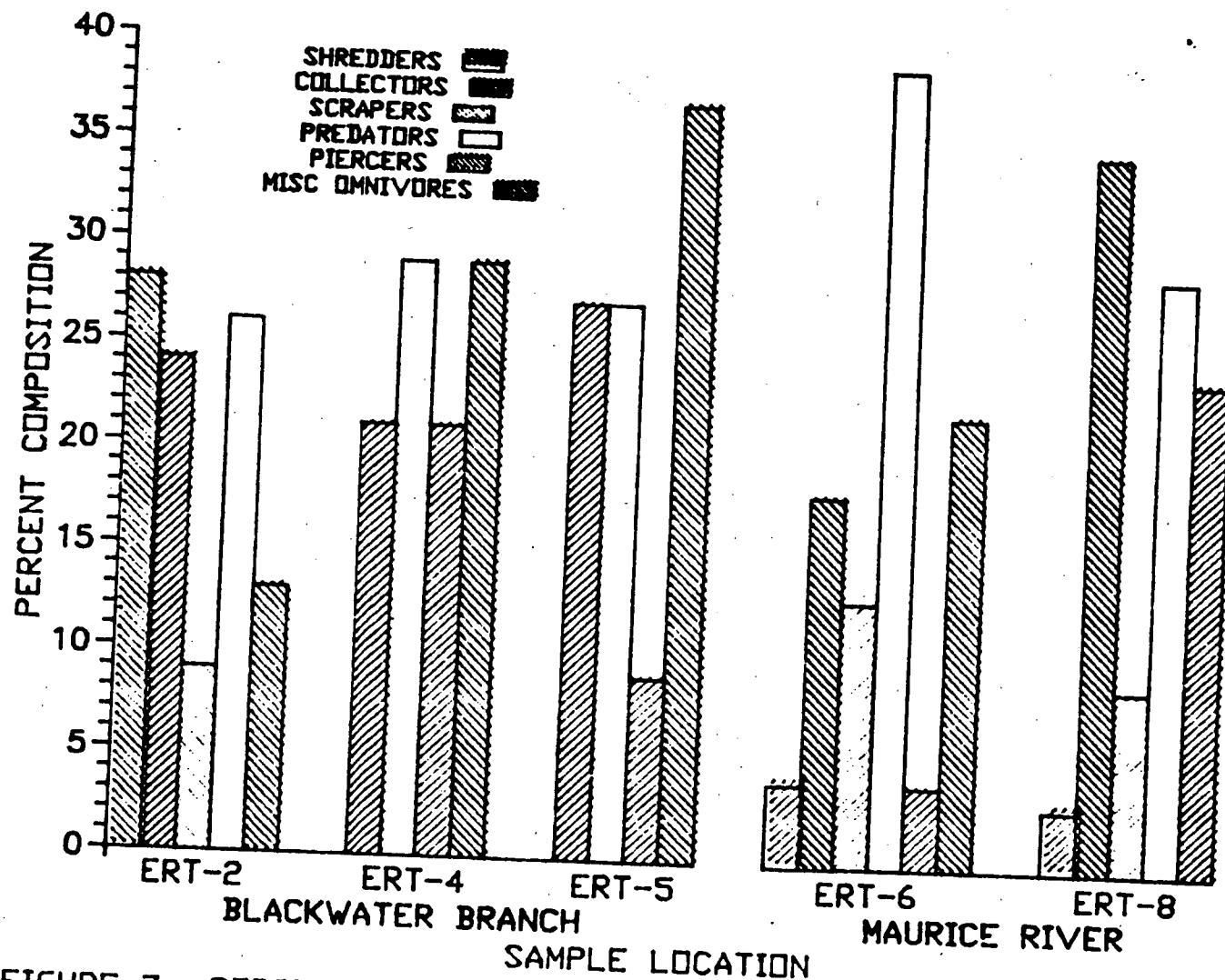


FIGURE 7. PERCENT COMPOSITION OF FUNCTIONAL FEEDING GROUPS AT BENTHIC INVERTEBRATE SAMPLING LOCATIONS

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TABLE 1. LOCATION OF SPECIFIC SAMPLING ACTIVITIES

VINELAND CHEMICAL SITE, VINELAND, NJ

May 5-6, 1988

Sampling Location	Water Body	Water Sampling	Sediment Sampling	Benthic Invertebrate Sampling	<u>Cordicula fluminea</u> Sampling	In-Situ Water Quality
ERT-2	Blackwater Branch	x	x	x		x
ERT-4	Blackwater Branch	x	x	x		x
ERT-5	Blackwater Branch	x	x	x		x
ERT-6	Maurice River	x	x	x		x
ERT-8	Maurice River	x	x	x		x
ERT-9	Union Lake	x	x			
ERT-10	Union Lake	x	x		x	
ERT-11	Union Lake	x	x		x	

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TABLE 2. FUNCTIONAL FEEDING GROUP ASSIGNMENTS OF TAXA COLLECTED FROM
 THE BLACKWATER BRANCH AND MAURICE RIVER
 VINELAND CHEMICAL SITE, VINELAND, NJ
 May 5, 1988

	Shredder	Collector	Scraper	Predator	Piercer	Misc.	Omnivore
Ephemeroptera							
<u>Ameletus</u>							
<u>Pseudocloeon</u>	X						
<u>Stenonema</u>	X						
<u>Eurylophella</u>	X		X				
Odonata							
<u>Dromogomphus</u>							
<u>Helocordula</u>						X	
<u>Calopteryx</u>						X	
<u>Coenarionidae</u>						X	
Plecoptera							
<u>Neoperla</u>							
<u>Isoperla</u>					X		
Hemiptera							
Corixini					X		
Megaloptera						X	
<u>Niagronia</u>							
Trichoptera							
<u>Polycentropus</u>						X	
<u>Cheumatopsyche</u>							
<u>Hydropsyche</u>	X					X	
<u>Hydroptila</u>	X						
<u>Lepidostoma</u>	X						
<u>Frenesia</u>	X						X
<u>Pycnopsyche</u>	X						
<u>Agarodes</u>	X						
<u>Helicopsyche</u>	X						
<u>Heterolectron</u>	X			X			
<u>Ceraclea</u>	X						
<u>Mystacides</u>	X		X				
<u>Oecetis</u>	X		X				
<u>Iriaenodes</u>	X				X		
Lepidoptera							
<u>Parapoynx</u>	X						

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TABLE 2 (CONTINUED)

	Shredder	Collector	Scraper	Predator	Piercer	Misc.	Omnivore
Coleoptera							
<u>Dineutus</u>					X		
<u>Peltodytes</u>						X	
<u>Paracymus</u>						X	
Diptera							
<u>Antocha</u>			X				
Ceratopogonidae							
Simuliidae	X			X			
Annelida							
Oligochaeta							
Hirudinea				X			X
Mollusca							
<u>Physa</u>							
<u>Lymnaea</u>						X	
<u>Helisoma</u>						X	
<u>Campeloma</u>		X					
<u>Ferrissia</u>		X					
<u>Sphaeriidae</u>	X						
Crustacea							
<u>Palamonetes</u>							
<u>Asellus</u>						X	
<u>Gammarus</u>						X	
Decapoda						X	

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TABLE 3. CONCENTRATIONS OF INORGANIC MATERIALS DETECTED IN WATER COLLECTED FROM THE BLACKWATER BRANCH, MAURICE RIVER AND UNION LAKE

VINELAND CHEMICAL SITE, VINELAND, NJ
May 5, 1988

Parameter	Sample Location							
	Blackwater Branch			Maurice River		Union Lake		
	ERT-2	ERT-4	ERT-5	ERT-6	ERT-8	ERT-9	ERT-10	ERT-11
Dissolved Arsenic (ug/l)	10U	290	210	10U	30	9.9J	16	15
Percent Dissolved	-	71	45	-	60	-	58	75
Particulate Arsenic (ug/l)*	-	120	250	-	20	-	10	5
Percent Particulate	-	29	54	-	40	-	42	25
Total Arsenic (ug/l)	10U	610	660	10U	50	11	26	20
Hardness (mg/l)	18	15	17	19	18	12	16	17

U - compound was analyzed for but not detected. The preceding number is the practical quantification limit for the compound.

J - compound was detected below the practical quantification limit. The level reported is approximate.

* - calculated value derived from the difference in the total and dissolved fractions.

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TABLE 4. IN-SITU WATER QUALITY OF THE
 BLACKWATER BRANCH AND MAURICE RIVER
 VINELAND CHEMICAL SITE, VINELAND, NJ
 May 5, 1988

Parameter	Sample Location				
	Blackwater Branch			Maurice River	
	ERT-2	ERT-4	ERT-5	ERT-6	ERT-8
Time	1510	1420	1345	1210	1130
Sampling Depth (cm)	20	20	50	40	50
Temperature ($^{\circ}$ C)	14.28	14.33	14.23	14.24	14.36
Dissolved Oxygen (mg/l)	8.99	9.50	9.07	9.30	9.35
Oxygen Saturation (%)	87	92	88	90	91
pH	5.43	5.54	5.46	5.27	5.12
Oxidation-Reduction Potential (mV)	222	193	258	207	246
Conductivity (mmhos/cm)	0.100	0.150	0.147	0.144	0.145

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TABLE 5. PHYSICAL - CHEMICAL CHARACTERISTICS OF SEDIMENTS COLLECTED FROM
THE BLACKWATER BRANCH, MAURICE RIVER, AND UNION LAKE

VINELAND CHEMICAL SITE, VINELAND, NJ
May 5-6, 1988

Parameter	Sample Location								
	Blackwater Branch			Maurice River		Union Lake			
	ERT-2	ERT-4	ERT-5	ERT-6	ERT-8	ERT-9	ERT-10	ERT-11	
Total Arsenic mg/kg	5.7	14,000	1,600	1.7	480	170	140	13	
Total Organic Carbon (%)	6.5	9.4	3.8	2.7	6.8	1.4	0.045	0.0078	
Total Residue (%)	11	11	25	21	12	60	74	72	
Mean Particle Size (mm)	0.45	0.12	0.31	0.25	0.14	0.80	0.41	0.14	
Sorting Value (Phi)	2.21	2.17	2.18	1.79	1.93	1.60	1.12	3.74	

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TABLE 6. BENTHIC INVERTEBRATES COLLECTED FROM THE BLACKWATER BRANCH AND MAURICE RIVER
 VINELAND CHEMICAL SITE, VINELAND, NJ
 May 5, 1988

TAXA	Sample Location										Maurice River									
	Blackwater Branch										ERT-6									
	ERT-2				ERT-4				ERT-5				ERT-8							
	A	B	C	T	A	B	C	T	A	B	C	T	A	B	C	T				
Ephemeroptera																				
<i>Ameletus</i>		2	1	3		2	7	1	10	7	6	16	29	9	9					
<i>Pseudocloeon</i>	16	19	5	40																
<i>Stenonema</i>	3	4	5	12									16	3	1	20	16	26	150	192
<i>Eurylophella</i>	4	3	7	14									1	1						
Odonata																	18	12	30	
<i>Dromogomphus</i>																				
<i>Heptagenia</i>	1		1		1				1					1	1	2	1	1	1	
<i>Coenagrionidae</i>	1	1	2											1	1	2	2	2	2	
Plecoptera																				
<i>Neoperla</i>																				
<i>Isoperla</i>																				
Hemiptera																				
<i>Corixini (a)</i>					1				1					2	1	3	2	2	1	1
Megaloptera																				
<i>Mesocronia</i>	1		1																	
Tricoptera																				
<i>Polycentrodes</i>	1	1	2			2		2	3		3									
<i>Chrysotusayche</i>																				
<i>Hydropsyche</i>																	6	6		
<i>Hydropsyche</i>																	2	2		
<i>Lepidostoma</i>	10	17	7	34						1		1					1	2	3	
<i>Frenenia</i>	21	21	5	47																
<i>Psychosyche</i>	1	5	6																	
<i>Agardes</i>	1		1																	
<i>Helicosyche</i>		1	1																	
<i>Heteroplectron</i>	1	2	2	5																
<i>Ceraclea</i>																				
<i>Myrtecidiae</i>	1		2														1	1		
<i>Onceris</i>	3		3																	
<i>Trigenodes</i>																				
Lepidoptera																				
<i>Parapolyx</i>	2		2														1	1		

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TABLE 6. CONTINUED

TAXA	Sample Location									
	Blackwater Branch					Maurice River				
	ERT-2		ERT-4		ERT-5	ERT-6		ERT-8		
	A	B	C	T		A	B	C	T	
Coleoptera										
<u>Dingutus</u>										
<u>Peltosches</u> (a)					1	1			1	1
<u>Peracymus</u> (a)					1	1			1	1
Diptera										
<u>Antocha</u>										
<u>Ceratopogonidae</u>									3	3
<u>Chironomidae</u>	13	9	8	30	26	62	4	92		
<u>Simuliidae</u>	1	1		2		11	1	12	26	19
									3	1
									1	1
									1	1
									2	2
annelida										
<u>Oligochaeta</u>	2	2	5	9						
<u>Hirudinea</u>	2		2		3	1	4			
									1	3
									1	4
Mollusca										
<u>Physa</u>					1	9	10			
<u>Lymnaea</u>						10	1	11		
<u>Helicoma</u>						1		1		
<u>Campeloma</u>									1	1
<u>Ferrissia</u>									1	2
<u>Sphaeriidae</u>	3	1	4	21	10	31		1	1	1
									1	1
									1	1
									1	1
Crustacea										
<u>Palaemonetes</u>					2	2				
<u>Asellus</u>	1	1	6	1	7				17	1
<u>Gammarus</u>	207	52	106	365	3	6	9	277	15	18
<u>Decapoda</u>								2	1	2
								7	14	2
								13	65	2
								97	175	

A, B, C, - Discrete samples collected at specified location.

T - Total number of individuals collected at specified location.

a - Adult

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TABLE 7. NUMERIC AND PERCENT COMPOSITION BY MAJOR TAXONOMIC GROUPS OF
BENTHIC INVERTEBRATES COLLECTED FROM THE BLACKWATER BRANCH AND
MAURICE RIVER

VINELAND CHEMICAL SITE, VINELAND, NJ
May 5, 1988

Taxa	Sample Location									
	Blackwater Branch					Maurice River				
	ERT-2 No.	%	ERT-4 No.	%	ERT-5 No.	%	ERT-6 No.	%	ERT-8 No.	%
Ephemeroptera	69	11.7	10	5.4	29	5.2	30	28.6	222	47.1
Odonata	3	0.5	2	1.1	0	-	6	5.7	5	1.2
Plecoptera	0	-	0	-	3	0.5	4	3.8	2	0.4
Hemiptera	0	-	1	0.5	0	-	0	-	0	-
Megaloptera	1	0.2	0	-	0	-	0	-	0	-
Tricoptera	101	17.1	2	1.1	4	0.7	1	0.9	13	2.8
Lepidoptera	2	0.3	0	-	0	-	0	-	0	-
Coleoptera	0	-	2	1.1	0	-	2	1.9	0	-
Diptera	32	5.4	104	56.5	133	23.8	6	5.7	3	0.6
Annelida	11	2.0	4	2.2	1	0.2	1	0.9	4	0.8
Mollusca	4	0.7	41	22.3	13	2.3	6	5.7	45	9.6
Crustacea	366	62.1	18	9.8	375	67.3	49	46.8	177	37.5
Total	589		184		558		105		471	

1) TR 002 1162

TABLE 8. COMPARISON OF VARIOUS DIVERSITY INDICES CALCULATED FOR BENTHIC
INVERTEBRATE COMMUNITIES, BLACKWATER BRANCH AND MAURICE RIVER

VINELAND CHEMICAL SITE, VINELAND, NJ
May 5, 1988

Diversity Index	Sample Location				
	Blackwater Branch			Maurice River	
	ERT-2	ERT-4	ERT-5	ERT-6	ERT-8
Number of Taxa	24	15	12	24	18
Number of Individuals	589	184	558	105	471
Margalef Diversity	8.303	6.182	4.005	11.379	6.360
Simpson Diversity	0.599	0.711	0.669	0.854	0.686
Maximum Diversity	0.960	0.938	0.918	0.968	0.946
Evenness	0.623	0.757	0.728	0.883	0.725
Shannon Diversity	1.574	1.736	1.448	2.341	1.493
Maximum Diversity	3.178	2.708	2.485	3.178	2.890
Evenness	0.495	0.641	0.583	0.737	0.517

VIN 002 1163

TABLE 9. ANALYSIS OF VARIANCE OF BENTHIC INVERTEBRATES COLLECTED
FROM THE BLACKWATER BRANCH

VINELAND CHEMICAL SITE, VINELAND, NJ
May 5, 1988

Taxa	Probability	R-Square	Contrast Probability		
			ERT-2 vs. ERT-4	ERT-2 vs. ERT-5	ERT-2 vs. ERT-4 & ERT-5
Ephemeroptera					
<u>Ameletus</u>	0.068	0.592	0.472	0.029	0.082
* <u>Pseudodoeon</u>	0.013	0.766	0.009	0.009	0.004
* <u>Stenonema</u>	0.001	0.941	0.001	0.001	0.001
* <u>Eurylophella</u>	0.005	0.834	0.003	0.003	0.002
Odonata					
<u>Heocordula</u>	0.630	0.143	1.000	0.420	0.635
<u>Calopteryx</u>	0.079	0.571	0.050	0.050	0.030
Plecoptera					
<u>Isoperla</u>	0.125	0.500	1.000	0.078	0.267
Trichoptera					
<u>Polycentropus</u>	0.932	0.023	1.000	0.755	0.856
* <u>Lepidostoma</u>	0.005	0.830	0.003	0.003	0.002
* <u>Frenesia</u>	0.017	0.742	0.011	0.011	0.006
<u>Pycnopsyche</u>	0.258	0.364	0.160	0.160	0.114
* <u>Heteroplectron</u>	0.001	0.893	0.001	0.001	0.001
<u>Mystacides</u>	0.079	0.571	0.050	0.050	0.030
<u>Decetis</u>	0.422	0.250	0.267	0.267	0.207
Lepidoptera					
<u>Parapoynx</u>	0.422	0.250	0.267	0.267	0.207
Diptera					
<u>Chironomidae</u>	0.418	0.253	0.216	0.702	0.342
<u>Simuliidae</u>	0.108	0.524	0.786	0.057	0.179

VIN 002 1164

TABLE 9 (CONTINUED)

Taxa	Probability	R-Square	Contrast Probability		
			ERT-2 vs. ERT-4	ERT-2 vs. ERT-5	ERT-2 vs. ERT-4 & ERT-5
Annelida					
* <u>Oligochaeta</u>	0.016	0.750	0.010	0.010	0.005
- <u>Hirudinea</u>	0.587	0.163	0.506	0.736	0.845
Mollusca					
<u>Physa</u>	0.543	0.184	0.376	0.333	0.290
Sphaeriidae	0.170	0.446	0.123	0.848	0.392
Crustacea					
<u>Palaemonetes</u>	0.422	0.250	0.267	1.000	0.506
<u>Asellus</u>	0.374	0.280	0.979	0.230	0.462
* <u>Gammarus</u>	0.047	0.638	0.022	0.049	0.019

* statistically significant at P<.05

VIN 002 1165

TABLE II. TEN DAY SOLID PHASE TOXICITY TEST RESULTS

VINELAND CHEMICAL SITE, VINELAND, NJ
May 5, 1988

Test	Sample Location					
	Blackwater Branch			Maurice River		
	ERT-2	ERT-4	ERT-5	ERT-6	ERT-8	Control**
<u><i>Hyalella azteca</i></u>						
percent survival	93	42*	76	91	93	38
<u><i>Daphnia magna</i></u>						
percent survival	85	100	65	90	85	100
number young	129	124	143	87	262	427
<u><i>H. azteca/D. magna</i></u>						
<u><i>H. azteca</i></u>						
percent survival	100	15	85	100	100	20
<u><i>D. magna</i></u>						
percent survival	80	50	25	80	65	45
number young	58	118	9	56	249	52

* - significant P<0.05

** - see text

VIN 002 1166

TABLE 10. NUMERIC AND PERCENT COMPOSITION BY FUNCTIONAL FEEDING GROUPS OF BENTHIC INVERTEBRATES COLLECTED FROM THE BLACKWATER BRANCH AND MAURICE RIVER

VINELAND CHEMICAL SITE, VINELAND, NJ
May 5, 1988

Functional Feeding Group	Sample Location									
	Blackwater Branch					Maurice River				
	ERT-2 No.	ERT-2 %	ERT-4 No.	ERT-4 %	ERT-5 No.	ERT-5 %	ERT-6 No.	ERT-6 %	ERT-8 No.	ERT-8 %
Shredders	6.5	28	0	-	0	-	1	4	0.5	3
Collectors	5.5	24	3	21	3	27	4	18	6	35
Scrapers	2	9	0	-	0	-	3	13	1.5	9
Predators	6	26	4	29	3	27	9	39	5	29
Piercers	0	-	3	21	1	9	1	4	0	-
Miscellaneous Omnivores	3	13	4	29	4	37	5	22	4	24
Total	23		14		11		23		17	

VIN 002 1167

APPENDIX M

VIN 002 1168

APPENDIX M
NJDEP 1979 SAMPLING EFFORT

VIN 002 1169

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TABLE I

**Water and Sediment Results for
All Variables from All Sites**

Site #	Site Description	River* Mile	Percent Sand	Percent Silt	Percent Clay	Percent Organic Matter	Total Iron (ug/l)	Total Arsenic in Water (ug/l)	Total Arsenic in Sediment (ug/l)
BLACKWATER BRANCH									
1.	Delsea Drive (Control)	-	-	-	-	35.460	18590.000	0.006	31.000
2.	Near Chemical Co.	0.0	43.000	27.000	30.000	36.410	15691.000	0.464	1510.000
3.	Near Chemical Co.	0.100	-	-	-	59.360	9659.000	33.200	21160.000
4.	Hill Road	0.400	-	-	-	46.740	4050.000	3.990	1310.000
5.	Maurice River Road	1.300	50.000	24.000	26.000	44.670	19865.000	3.150	5520.000
MAURICE RIVER ABOVE UNION LAKE									
6.	Garden Road (Control)	-	25.000	55.000	20.000	39.160	29525.000	0.002	23.000
7.	Almond Road (Beach)	2.600	75.000	14.000	11.000	24.460	-	0.574	630.0
8.	Landis Avenue	2.900	-	-	-	51.790	30618.000	0.373	2576.000
9.	Little Robbins Brook (Control)	3.900	100.000	0.0	0.0	0.640	1836.000	0.004	1.000
10.	Sherman Avenue	7.600	-	-	-	39.220	-	0.263	5704.000
UNION LAKE									
11.	Behind Island	8.600	-	-	-	46.680	28431.000	0.266	561.000
12.	Near Eastern Shoreline	8.900	6.000	28.000	66.000	40.590	12211.000	0.242	377.000
13.	Behind Island	9.400	54.000	19.000	27.000	24.560	11117.000	0.222	267.000
14.	Near Western Shoreline	10.200	-	-	-	1.720	419.000	0.225	14.000
15.	Near Swamp on West Shore	9.700	-	-	-	1.120	378.000	0.249	13.000
16.	Where Mill Creek enters Lake	10.000	24.000	44.000	32.000	60.540	9659.000	0.192	56.000
17.	Deepest Portion of Lake by the Dam Spillway	10.800	1.0	36.0	61.0	43.100	34628.000	0.236	478.000

(-) = Analysis not performed

(*) = From Chemical Company

Site #	Site Description	River Mile	Percent Sand	Percent Silt	Percent Clay	Percent Organic Matter	Total Iron (ug/l)	Total Arsenic In Water (ug/l)	Total Arsenic in Sediment (ug/l)
46.	River Channel	32.600	45.000	25.000	30.000	5.160	9113.000	0.018	23.000
47.	River Channel	33.500	-	-	-	7.710	10024.000	0.024	30.000
48.	River Channel	34.500	4.000	22.000	74.000	17.550	4921.000	0.019	14.000
49.	River Channel	35.800	3.000	56.000	41.000	11.220	-	0.016	50.000
50.	Bay Bottom (Dredged Channel)	35.800	11.000	49.000	40.000	7.710	-	0.018	26.000
51.	Bay Bottom (Undisturbed)	35.800	0.0	30.000	70.000	9.360	12383.000	0.017	44.000

(-) = Analysis not performed

(*) = From Chemical Company

Site #	Site Description	River ^a Mile	Percent Sand	Percent Silt	Percent Clay	Percent Organic Matter	Total Iron (ug/l)	Arsenic in Water (ug/l)	Arsenic in Sediment (ug/l)
MAURICE RIVER ESTUARY BELOW UNION LAKE									
18.	River Channel	13.400	90.000	3.000	7.000	1.200	4192.000	0.237	57.000
19.	River Channel	13.600	57.000	28.000	15.000	17.750	20594.000	0.152	19.000
20.	Cut-off Meander of River Channel	14.100	-	-	-	14.970	17132.000	0.212	316.000
21.	Tidal Mud Flat	14.400	74.000	12.000	14.000	6.540	4010.000	0.210	90.000
22.	Headwater of Tidal Channel	14.100	94.000	4.000	2.000	1.190	1391.000	0.180	33.000
23.	Tidal Marsh	15.000	-	-	-	14.760	-	0.215	256.000
24.	Tidal Marsh	15.800	-	-	-	3.920	-	0.222	12.000
25.	Foot of Abandoned Dyke	15.800	91.000	4.000	5.000	0.420	743.000	0.135	5.000
26.	Headwater of Tidal Channel	16.100	7.000	60.000	31.000	21.800	13122.000	0.123	166.000
27.	Tidal Mud Flat	16.300	-	-	-	15.980	-	0.131	102.000
28.	River Channel	17.000	87.000	6.000	7.000	1.400	2660.000	0.111	19.000
29.	Dyked Area; Disturbed Tidal Marsh	17.600	-	-	-	0.910	4010.000	0.111	44.000
30.	Manantico Creek	18.100	-	-	-	0.490	1276.000	0.035	5.000
31.	River Channel	18.500	21.000	45.000	32.000	9.120	11304.000	0.091	21.000
32.	Tidal Mud Flat	18.700	19.000	45.000	36.000	17.510	4739.000	0.088	83.000
33.	Tidal Marsh	18.600	0.0	20.000	80.000	6.090	-	0.099	21.000
34.	River Channel	19.800	81.000	6.000	13.000	0.770	4725.000	0.086	14.000
35.	Tidal Marsh	20.700	1.000	12.000	67.000	3.570	8745.000	0.082	16.000
36.	River Channel	20.800	-	-	-	11.220	-	0.079	76.000
37.	Tidal Mud Flat	21.300	-	-	-	14.730	76555.000	0.067	128.000
38.	Headwater of Tidal Channel	22.600	-	-	-	11.700	10388.000	0.073	107.000
39.	Mouth of Tidal Channel	24.900	-	-	-	7.020	7837.000	0.047	32.000
40.	Mouth of Tidal Channel	24.700	1.000	47.000	52.000	14.160	10935.000	0.082	40.000
41.	River Channel	26.500	98.000	0.0	2.000	0.070	300.000	0.049	27.000
42.	Foot of Abandoned Dyke	28.350	1.000	81.000	18.000	5.640	8748.000	0.039	15.000
43.	Tidal Marsh	27.500	1.000	34.000	65.000	11.280	18043.000	0.009	125.000
44.	Headwater of Tidal Channel	27.500	-	-	-	21.060	17132.000	0.045	93.000
45.	Mouth of Tidal Channel	30.600	35.000	16.000	49.000	33.040	11117.000	0.030	28.000

(-) = Analysis not performed

(*) = From Chemical Company

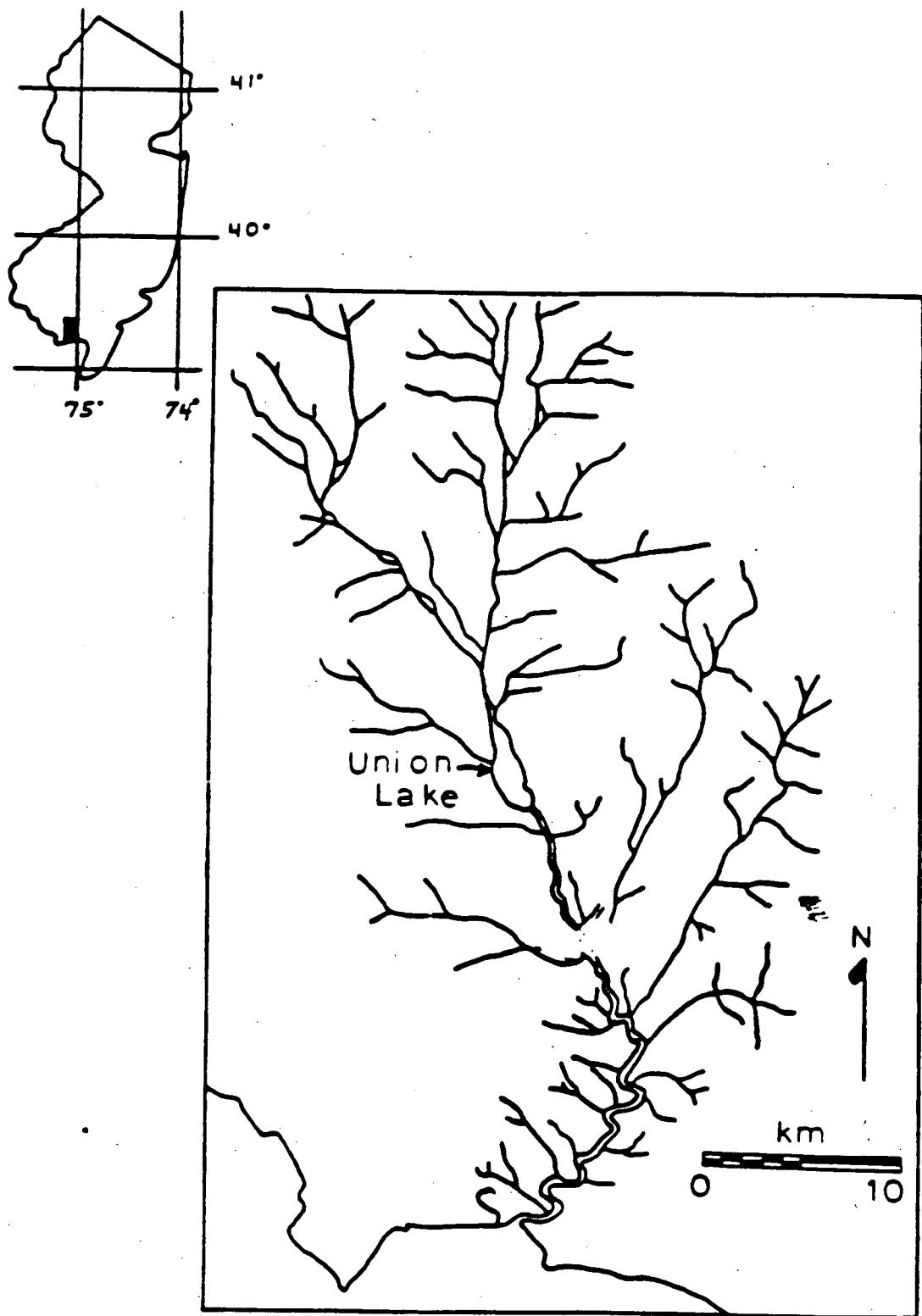
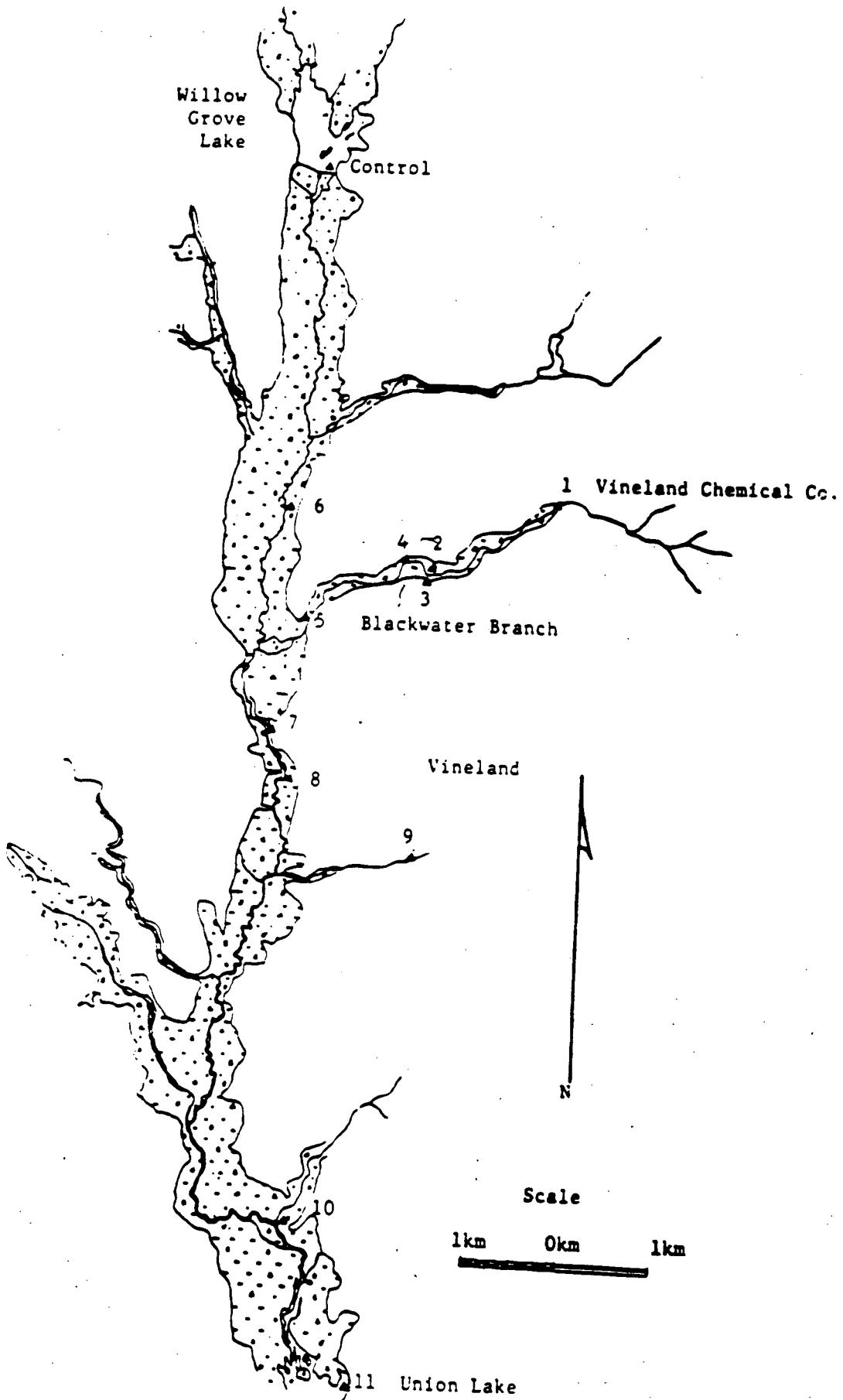
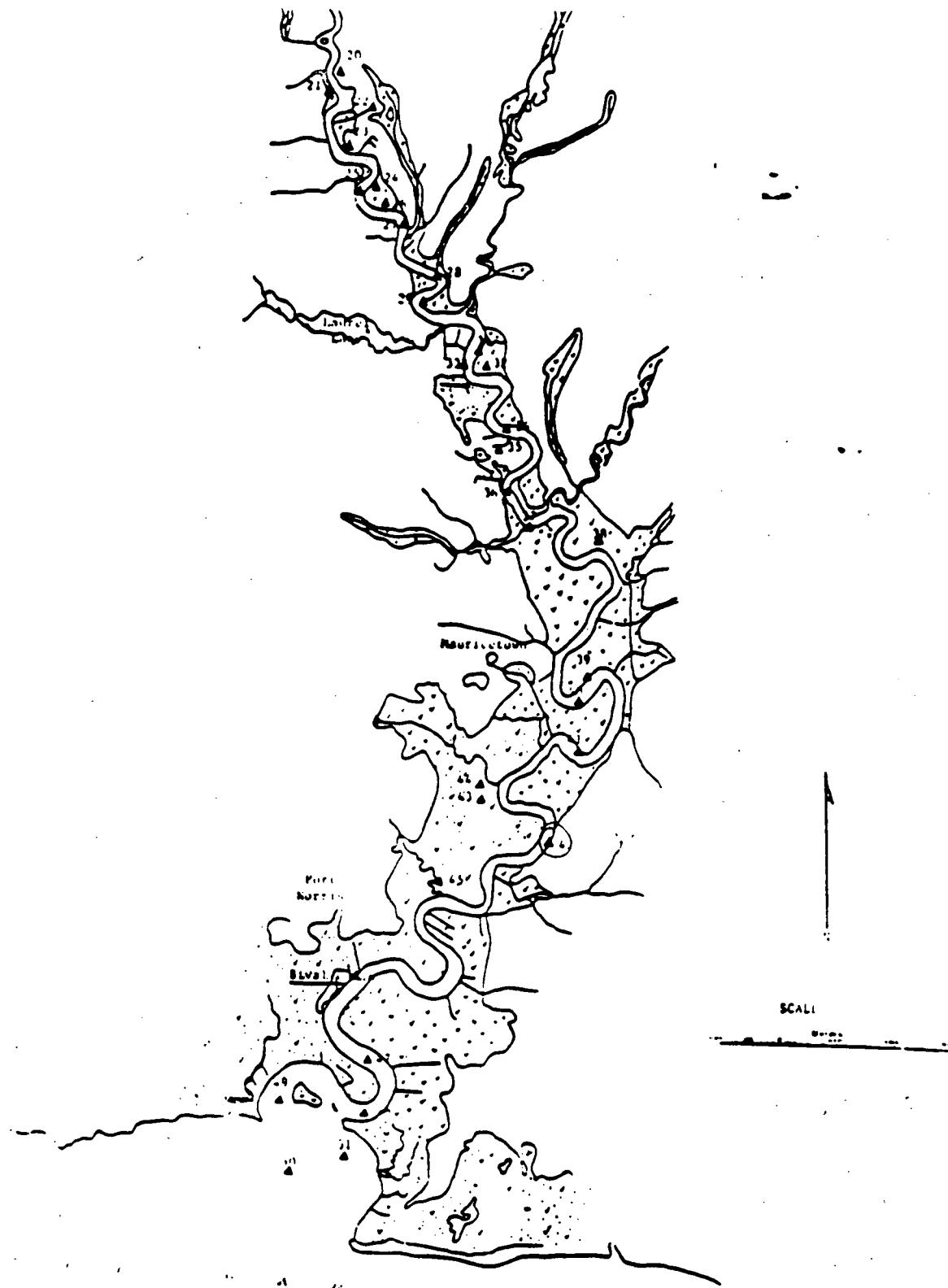


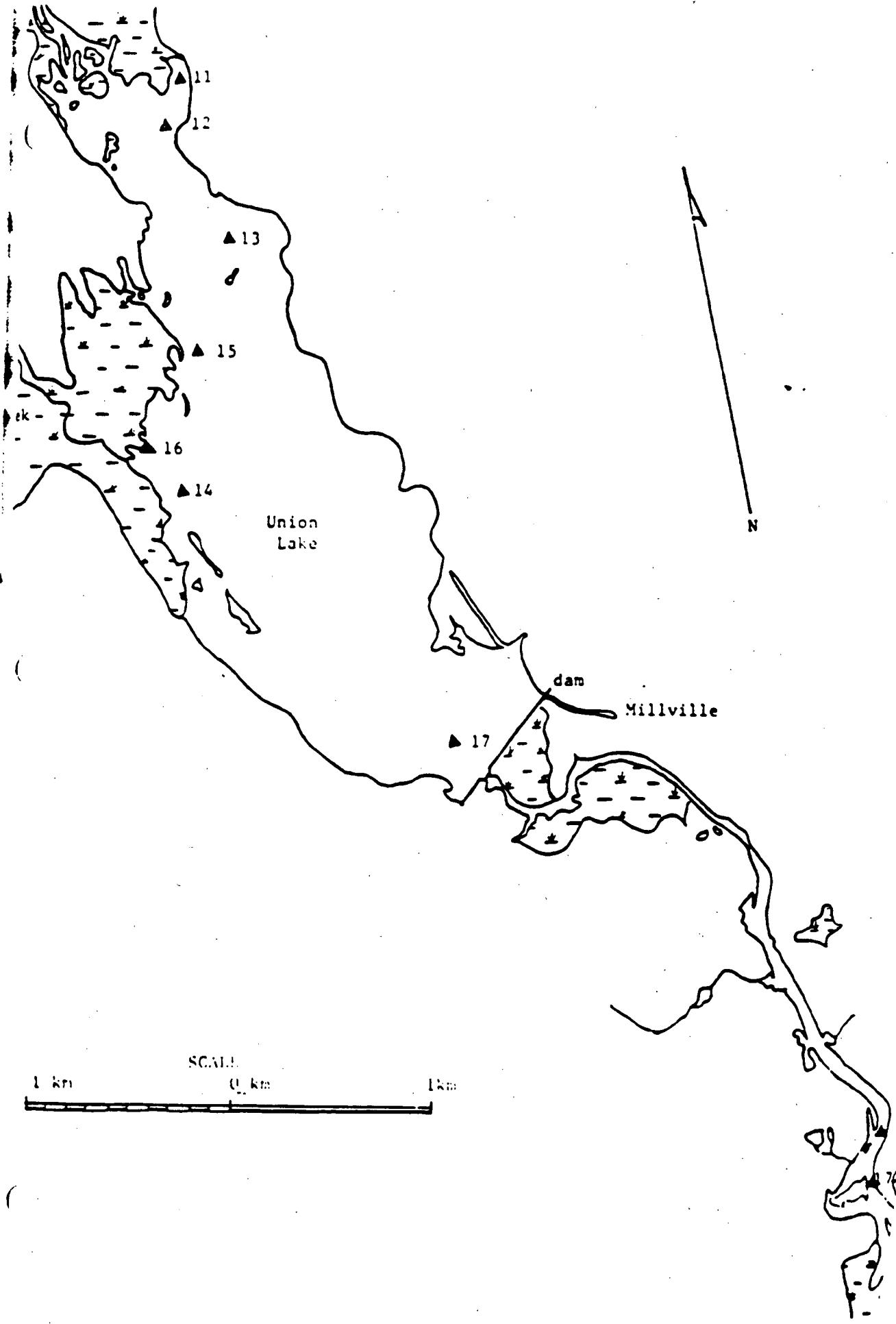
Figure 1. Location map of Maurice River - Union Lake study area.



VIN 002 1174



VIN 002 1175



VIN 002 1176

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